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ABSTRACT

Through the 4-H Wheat Science project, students learn the importance of wheat from the complete process of growing wheat to the final product of bread. The curriculum is designed to include hands-on experiences in science, consumer education, nutrition, production economics, vocabulary, and applied mathematics. Teachers can select those units out of eight which enhance the individual classroom needs. The eight units include: (1) "Comparisons and Contrasts"; (2) "Wheat Science Experiments"; (3) "Wheat Production and Marketing"; (4) "Consumer Education/Nutrition"; (5) "Math Practical Application"; (6) "Wheat Trivia Game"; (7) "Breadmaking"; and (8) "Cultural Breads--Bread the World Over." Supplemental wheat science activities and a resource list of audiovisuals and literature are included. (KR)

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Nebraska Cooperative Extension Service 4-H 213

4-H Wheat Science Program

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Designed for Sixth Grade Teachers and Students

Sponsored by:
The Nebraska Cooperative Extension Service
The Nebraska Wheat Board
Metz Baking Company

SE051756

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

WHAT IS THE 4-H SCHOOL ENRICHMENT PROGRAM?

Cooperation between the school systems and the Nebraska Cooperative Extension Service has existed for many years, complementing the educational goals of both organizations. The materials used in 4-H are based on research and current technical knowledge. Four-H School Enrichment resources include teacher guides, video cassettes, teaching exercises and audio visual support.

Participants in 4-H School Enrichment programs "learn by doing," which helps young people learn and apply practical living skills. As 4-H participants, your students have the opportunity to take part in 4-H activities outside the classroom, such as county fair and demonstration contests.

WHAT IS THE 4-H WHEAT SCIENCE SCHOOL ENRICHMENT PROJECT?

Can you imagine living without lasagna, cinnamon rolls, cake, cookies, or pancakes? Through the 4-H Wheat Science project, students learn the importance of wheat from the complete process of growing wheat, to the final product of bread.

Curriculum is designed to include hands-on "learn by doing" experiences in science, consumer education, nutrition, production economics, vocabulary and applied mathematics. Teachers select those units which enhance the individual classroom needs.

The climax of the program is a hands-on breadmaking experience conducted by the Cooperative Extension staff. Each student will take home a mini-loaf of bread!

The program is designed for upper elementary grades, preferably sixth grade; however, if the project content enhances the seventh grade curriculum in specific schools, and the sixth grade chooses not to participate, it may be offered at the seventh grade level.

HOW DOES THE PROGRAM WORK?

Upon registration, teachers will receive a packet at a teacher training. This packet will include a step-by-step "4-H Wheat Science Teacher's Guide," which was developed cooperatively by teachers, Extension professionals, and the Nebraska Wheat Board.

THE COOPERATIVE EXTENSION SERVICE PROVIDES:

Teacher training
Teacher manual
Breadmaking supplies
Supplemental resource materials
Master for optional student handouts
Student handout material
"I Am Wheat" video/film
Enrollment and evaluation forms
Classroom presentation (optional)
Assistance with classroom breadmaking (optional)

SCHOOL PROVIDES:

Teacher and students
Teacher to attend training
Use of audio visual equipment
Student data on participants
Evaluation report
Assistance with breakmaking

DESIGNED BY THE 4-H WHEAT SCIENCE SCHOOL ENRICHMENT ADVISORY COMMITTEE

Maureen Burson, Lancaster County Extension Agent - 4-H
Sue Bush, Sarpy County Extension Agent - Home Economics
Keith Dirks, Teacher — Trinity Lutheran School
Virginia Gobeli, State 4-H Specialist
Steve Gramlich, Lancaster County, Extension 4-H Assistant
Marynelle Green, Teacher — Zeman School
Carolyn Logue, NE Wheat Board
Nancy Malone, Lancaster County, Extension 4-H Assistant
Edith Meints, Teacher — Randolph School
Marvin Mueller, Wheat Producer
Vivian Vandewege, Teacher — Norris School

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developed by Steve Gramlich & Nancy Malone, Extension Assistants, 4-H Lancaster County, Nebraska
- Activity 1 - Cereal Grains
- Activity 2 - Grain Heads
- Activity 3 - Wheat Flour Types

UNIT 2 - WHEAT SCIENCE EXPERIMENTS
developed by Virginia Gobeli, Extension Specialist, 4-H - UNL and Randy Wehling, UNL Agronomy Department, Donald Kuhowt, Plattsmouth Middle School, and Sue Bush, Sarpy County
- Activity 1 - Hard Versus Soft Wheat Test
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developed by Steve Gramlich, Extension Assistant, 4-H Lancaster County, Nebraska
- Activity 1 - Seed to Harvest
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- Activity 4 - Careers

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developed by Steve Gramlich, Extension Assistant, 4-H Lancaster County, Nebraska

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developed by Maureen H. Burson, Extension Agent, 4-H Lancaster County, Nebraska
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- Questions and answers

UNIT 7 - BREADMAKING
developed by Nancy Malone, Extension Assistant, 4-H Lancaster County, Nebraska
- Activity 1 - Breadmaking

UNIT 8 - CULTURAL BREADS - BREAD THE WORLD OVER
developed by Sue Bush, Extension Agent, Home Economics, Sarpy County, Nebraska
- Activity 1 - The History of Bread
- Activity 2 - International Breads
- Activity 3 - Breads and Customs

GLOSSARY

SUMMARY OF PROGRAM CONTENT

Each unit is designed to be used independently or in combination with other units. This will provide teachers the flexibility to conduct learning experiences which meet the needs of their individual classrooms.

UNIT 1 - COMPARISONS AND CONTRASTS

The purpose of this unit is to help students gain a basic understanding of the similarities and differences between 1) cereal grains, 2) grain heads, and 3) wheat flour types.

UNIT 2 - WHEAT SCIENCE EXPERIMENTS

Unit 2 will provide an opportunity for children to examine and learn some of the scientific facts and properties of flours and grains.

UNIT 3 - WHEAT PRODUCTION MARKETING

Students will gain an understanding of the wheat production cycle and the people involved, from the seed to the finished product. This unit includes 1) plant growth, 2) grain marketing, 3) the milling process, and 4) careers involved in this industry.

UNIT 4 - CONSUMER EDUCATION/NUTRITION

Unit 4 is designed to create an awareness of the large variety of wheat flours available in our grocery stores and the uses of specialty wheats. It is also designed to create an awareness of the value of wheat products to a healthy body.

UNIT 5 - MATH PRACTICAL APPLICATION

Students will gain an understanding of the importance of practical math application in the day-to-day operations of a business.

UNIT 6 - WHEAT TRIVIA GAME

The Wheat Trivia Game is designed to reinforce learning which students have experienced in all units. This unit, containing rules, questions and answers, will provide students an incentive to review Wheat Science learning experiences.

UNIT 7 - BREADMAKING

The purpose of this unit is to help students understand the scientific principles of breadmaking by individually experiencing the breadmaking process.

UNIT 8 - CULTURAL BREADS - BREAD THE WORLD OVER

Children will learn and discuss how important bread is through the study of 1) the history of bread, and 2) breads from different cultures.

4-H SUPPLEMENTAL WHEAT SCIENCE ACTIVITIES

4-H POSTER CONTEST

Conduct a Wheat Science Poster Contest in your school. Local extension staff will coordinate the judging of the posters and present championship ribbons to the winners. All posters would be eligible for county 4-H fair competition.

4-H DEMONSTRATION AND SPEECH CONTESTS

Students have the opportunity to develop public presentation skills by preparing and presenting a demonstration or speech about wheat science. Extension staff or volunteers will provide guidance to students wishing to develop presentations. Students may select the topic of their choice. They may demonstrate something simple such as "how to measure flour" or a complex scientific experiment. A 4-H manual explaining how to prepare a public presentation is included in the supplementary activity section of the 4-H Wheat Science Teacher's Notebook.

EXHIBIT AT THE COUNTY FAIR

Students may enter a loaf of bread or a poster in the county fair in the late summer. Students have the opportunity to participate in the interview judging process. At this time the student meets with the judge to discuss his or her project. Some teachers may wish to collect the posters before the end of school and enter them in the county fair for the students. Each entry requires a 4-H entry tag, available from the local Extension Office. The Extension staff will be happy to assist your class with fair entries. Students will be awarded 4-H ribbons for their exhibits.

ORGANIZE A 4-H PROJECT CLUB

If selected students wish to continue their study of wheat science, they may wish to form a 4-H project club. The club could enroll in a 4-H food project, marketing project, or perhaps an agricultural project. A parent with one of these special interests may wish to lead the club. The Extension staff will assist in organizing the club and training the leaders.

WHEAT SCIENCE TRIVIA CONTEST

Students may wish to challenge another classroom or school to a Wheat Science Trivia Contest. Students could be responsible for writing questions for the contest. Some local Extension offices have an electronic quiz bowl device which may be used for this contest. One-hundred prepared questions are included in Unit 6.

CLASSROOM GUEST SPEAKERS

An artist could demonstrate the art of wheat weaving.

A wheat farmer could demonstrate how wheat is planted and explain the day-to-day life of a farmer.

The kitchen supervisor could tell about how the bread is baked for their school lunch program. Or ideally, could give students a quick tour of the school kitchen during the bread baking process.

A food scientist could explain careers available in the food industry.

International students could explain about food in their native country.

TOUR OPPORTUNITIES

Tour a local bakery.

Tour the school kitchen while food is being prepared.

Tour a machinery dealership.

Tour the university agronomy or food science department.

BOOK REPORTS

Students could report on current events which relate to the food industry.

Students could report on books available from the public library.

Students could report on the different types of recipes using wheat, which they find in cookbooks.

Students could look through farm magazines to discover the different types of machinery, fertilizer, seeds, and general farm products which are involved in grain production.

4-H WHEAT SCIENCE SCHOOL ENRICHMENT RESOURCE LIST

AUDIO VISUALS

I AM WHEAT. 11 minutes. Available in film, 1/2- and 3/4-inch videocassette. Funded by Metz Baking Company and the Nebraska Wheat Board. Contact your local extension office. Excellent overview of all aspects included in the project. 1984.

WHEAT PRODUCTION AND MARKETING. 10 minutes. Available in slide set and 1/2-inch VHS. Funded by Metz Baking Company. Developed by Rick Waldren, UNL Department of Agronomy. Contact your local extension office. Excellent supplement to Unit 3, Production and Marketing. 1987.

LITERATURE

CONSUMER EDUCATION/NUTRITION

CHOOSING, USING AND STORING GRAINS AND FLOURS. University of Nebraska Cooperative Extension Service. HEG 80-127.

FACTS ABOUT FIBERS. Wheat Foods Council courtesy of Nebraska Wheat Board. 1977.

GRAINS AS FOOD. University of Nebraska Cooperative Extension Service. EC 84-408.

INSIDE WHEAT FOODS. Wheat Industry Council courtesy of Nebraska Wheat Board.

NATURE'S BEST...WHEAT FOODS. Nebraska Wheat Board.

WHEAT FOODS...THE NATURAL CHOICE. Nebraska Wheat Board.

MARKETING PRODUCTION

HOW TO FALLOW. University of Nebraska Cooperative Extension Service. G74-110.

HOW TO PLANT WHEAT. University of Nebraska Cooperative Extension Service G73-35.

RELIABLE AMERICAN FARMER. Sperry New Holland, Dept. 215, New Holland, PA 17557. 1985.

U.S. WHEAT. U.S. Wheat Associates courtesy of Nebraska Wheat Board.

WHEN TO PLANT WHEAT. University of Nebraska Cooperative Extension Service. G73-36.

RECIPES - COURTESY OF NEBRASKA WHEAT BOARD

COOKING WITH BULGAR WHEAT
FOREIGN FLAT BREADS
WHEAT SAMPLE FOR CHILDREN
WHEAT TREATS FOR CHILDREN. Student Handout.
WHOLE WHEAT RECIPES

A complete listing of educational materials available from the Nebraska Wheat Board is included in the "Educational Materials" Brochure in the resource section of the teacher's guide.

POSTERS

$1 Spent, $100 Return
Wheat Energy Natural

Willie Wheat (educational aid)
Nebraska Wheat Hearts

_____

Date

Dear Parents/Guardian,

During the next two weeks our class will be studying the importance of wheat in our food supply and our daily diets.

Students will learn the steps taken from the planting of the wheat seed to the arrival on our breakfast, lunch and dinner tables. Many exciting and informative activities are planned.

Your cooperation will be needed to help supply nutrient labels from wheat products that are used by your family.

We hope these activities will help promote an awareness and appreciation of the wheat growth in Nebraska.

Thank you.

_____

Teacher

Nebraska Cooperative Extension Service 4-H 214

COMPARISON AND CONTRAST

UNIT 1

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

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PURPOSE

To help students gain a basic understanding of the similarities and differences between 1) cereal grains, 2) grain heads, and 3) wheat flour types through the use of samples provided by the Cooperative Extension Service.

SUMMARY OF LEARNING ACTIVITIES

Small group discussion to compare samples of cereal grains, grain heads, and types of wheat flour through hands-on experiences and visual aids.

OBJECTIVES

The student will be able to:

1. compare cereal grains for size, texture, shape, color, and other characteristics, through the use of samples.
2. contrast the different parts of the various grain heads provided as examples.
3. compare samples of common types of wheat flour which can be purchased locally.

VOCABULARY

wheat	seed
millet	chaff
oats	unbleached flour
spikelet	whole wheat flour
kernel	all-purpose flour
beard	corn
cake flour	rye
self-rising flour	spike
farina	awn
milo (grain sorghum)	grain
barley	flour
popcorn	bread flour
grain head	graham flour

See GLOSSARY for definition of vocabulary words.

LIST OF SUPPLIES PROVIDED BY LOCAL EXTENSION STAFF IN CLASSROOM KIT

(These depend upon availability)

Cereal grain samples:

wheat	milo	corn
millet	barley	rye
oats	popcorn	

Grain head samples:

wheat	milo	corn
millet	barley	rye
oats	popcorn	

Wheat flour types:

cake	unbleached	bread
graham	whole wheat	all-purpose
self-rising	farina	

ACTIVITY I-1

1. Have students characterize each of the grains by color, size, shape, texture and other differences.
2. Have students identify similarities between grains.
3. Quiz questions can be used to summarize the similarities/differences between the grains. The activity could include a written test, a team oriented game, or discussion group summary.

SUMMARY QUESTIONS

Q: Which cereal grain has a wrinkled appearance?
A: Barley.
Q: Name two other grains that are similar in shape to wheat?
A: Rye, oats, or barley.
Q: Name two grains that are round in appearance?
A: Milo (grain sorghum), millet, or popcorn.
Q: Which grain is shaped like wheat but longer and more pointed?
A: Oats.
Q: Name two grains which are red?
A: Milo and millet.
Q: Which grain is brightest yellow?
A: Corn.
Q: Which grains are basically the same size as wheat?
A: Barley and rye.
Q: Name two grains which are similar in color to wheat?
A: Barley and rye.
Q: Which grain may have kernels that are flatter and more triangular than the other grains?
A: Corn.

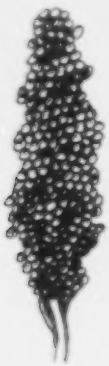
ACTIVITY I-2

1. Have students identify the similarities within the different types of grain heads.
2. Have students characterize the differences between the different grain head structures by head type, plant structure, and other differences.
3. Have students match the plant structures with the grain on the activity sheet.
4. Quiz questions can be used to summarize the similarities/differences between the grain plant structures. This activity could include a written test, a team oriented game, or discussion group summary.

SEE ACTIVITY I-2

STUDENT ACTIVITY SHEET I-2

Match the following seed head structures with the grain that best fits the description.

HEAD TYPE		GRAIN TYPE
A Spike		___A___ WHEAT
B Open panicle		___D___ CORN
C Closed or semi-closed panicle		___B___ OATS
D Pistillate		___C___ MILO (GRAIN SORGHUM)
		___C___ MILLET
		___D___ POPCORN
		___A___ RYE
		___A___ BARLEY

ACTIVITY I-3

1. Have students characterize each of the flours according to color and texture. (Students may need to feel samples for better appreciation of the differences.)
2. Discuss the similarities and differences between the flour samples.
3. Quiz questions can be used to summarize the similarities/differences between the flours. The activity could include a written test, a team oriented game, or discussion group summary.

SAMPLE QUESTIONS

Q: Which flour has the most coarse texture?
A: Farina.
Q: Which flour is darker in appearance?
A: Whole wheat.
Q: Which flour has a more silky texture?
A: Cake flour.
Q: Between unbleached, bread, and all-purpose flours, which flour is yellowest?
A: Unbleached.
Q: Name two flours which have food product names.
A: Bread and cake.
Q: Which flours are least similar in texture to all-purpose?
A: Farina and whole wheat.
Q: Which flour looks like cream of wheat cereal?
A: Farina (farina is the major ingredient).

Nebraska Cooperative Extension Service 4-H 215

WHEAT SCIENCE EXPERIMENTS

UNIT 2

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PURPOSE

To provide an opportunity for children to examine and learn some of the scientific facts and properties of flour.

SUMMARY OF LEARNING ACTIVITIES

1 - Hard versus soft wheat test
2 - Starch test
3 - Gluten formation
4 - Grinding wheat into flour
5 - Popping wheat
6 - Thickening (gelatinization) properties of flour
7 - Yeast Unit - Good food sources for yeast, chemicals harmful to yeast

OBJECTIVES

1 - Distinguish between hard and soft wheat flour.
2 - State why hard wheat flour is best to use in yeast bread.
3 - Determine that flour contains starch.
4 - Recognize some of the properties of gluten.
5 - State why gluten is important in making bread.
6 - Understand the role of starch in gelatinization.
7 - Understand why grains "pop".
8 - Understand how yeast works.

VOCABULARY

HARD WHEAT FLOUR: Flour made from hard wheat. It has a high protein content that forms an elastic gluten with good gas-retaining properties. Hard wheat flour is suitable for the production of yeast-leavened bread.

SOFT WHEAT FLOUR: Flour made from soft wheat. It has a low protein content and has poor gas-retaining properties. It is usually used for making quick breads, cakes and cookies.

HARD WHEAT: Wheat in which the endosperm tends to break between the cells producing a flour that is granular to the touch and free flowing. It also has a high protein content.

SOFT WHEAT: Wheat in which the endosperm tends to be pulverized so that few or no whole cells are left. The flour is softer to the touch and tends to clump together. Its protein content is lower than for hard wheat.

GLUTEN: The name given to the protein part of wheat. It is that part of the flour which gives it the elastic properties needed for making bread.

STARCH: A white, odorless, tasteless, powdery complex carbohydrate that is the chief storage form of carbohydrate in plants. It is an important substance with food value.

KNEAD: To manipulate with a pressing, folding and stretching motion.

YEAST: The leavening agent for breads which makes them rise and makes bread light.

THICKENING: The act of making a liquid thick or more dense.

THICKENING AGENT: Something used to thicken, like flour in a gravy.

GELATINIZATION: To convert into a form resembling gelatin or jelly. The process of heating a starch and water solution to swell granules so that the solution becomes translucent and thick.

WHEAT BERRY: The entire grain of wheat. Also known as a kernel.

ENDOSPERM: The starchy interior of the grain.

GERM: Embryo or seedling plant in the grain.

BRAN: Coat of the grains and associated tissue.

HARD/SOFT WHEAT INFORMATION

The baking quality of flour depends on both the type of wheat and the way in which it is milled.

The vitamin and mineral content depends more on the method of milling than on the type of wheat.

TYPES OF WHEAT

Wheat is often classified as hard or strong and soft or weak. It is also classified as spring or winter wheat.

HARD WHEAT

In the milling process, the endosperm of hard wheat

tends to break between the cells which produces a flour that is granular to the touch and free flowing. Hard wheat is higher in protein than soft wheat and also has better gluten qualities than soft wheat flour. Durum wheat is an extremely hard wheat with a very high protein content. It belongs to a botanical species different from that of the common wheats.

SOFT WHEAT

In milling, the endosperm of soft wheat tends to be pulverized so that few or no whole cells are left. The resulting flour is softer to the touch than flour made from hard wheat and tends to clump together like talcum. Soft wheat usually has a lower protein content than the other wheat classes.

The greatest significance of the difference between these two classifications of wheat is in their baking qualities.

Flour made of hard wheat is especially suited for making bread. The superiority of hard wheat flour for bread is due to the large amount and good quality of gluten it forms when mixed with water. Durum wheat produces a flour that is very high in protein and therefore forms a large amount of good quality gluten. Durum wheat is used in the making of macaroni, spaghetti and similar products.

Flour made from soft wheat is best for various types of cakes, pastries and crackers. The protein content is lower, which produces less gluten that is softer. This is desirable when one wants a product that is tender, flaky and light, like cake and pastry.

WINTER WHEAT

Winter wheat is planted in the fall and is harvested in early summer. It is planted in the fall so that it can develop a root system before cold weather. It grows rapidly in the spring. Winter wheat can be grown only in areas where the root system can survive the winter. Winter wheat usually has higher yields.

SPRING WHEAT

Spring wheat is planted in the spring and harvested in the late summer. Spring wheat is usually harder.

WHERE VARIOUS TYPES OF WHEAT ARE GROWN

White Wheat (hard or soft)	Predominantly in Pacific Northwest, California, and Michigan
Hard red spring wheat and durum wheat	Northern Great Plains, prairies of Canada and steppes of Russia.
Hard red winter wheat	Mainly on Southern Great Plains.
Soft red winter wheat	Eastern half of the United States.

PROTEIN CONTENT OF WHEAT

The protein content of wheat is shown in the table below.

CLASS	PROPORTION OF TOTAL PRODUCTION	PROTEIN CONTENT OF WHOLE GRAIN
	%	%
Hard red spring	18	14.0
Hard red winter	45	12.2
Soft red winter	16	10.3
White (winter and spring)	17	9.2
Durum	4	14.0

Durum wheat has the highest protein content of the different classes. It is used for pastas. Hard red spring wheat and hard red winter wheat have the next highest protein content. Both of these wheats make good bread flour. Soft red winter and white wheat have lower protein content than the other three classes of wheat.

The difference in protein content is due largely to the climate of the area in which the wheat is grown. Conditions favoring rapid maturation of the grain have been found to produce high protein content. Such conditions, which include heavy rainfall in the spring and early summer, hot dry weather during the ripening of the grain, and severe winters, prevail in the Great Plains, especially the northern part. Wheats of relatively low protein content, such as soft red winter and white wheat, are grown in the coastal and Great Lakes areas where the climate is relatively mild and humid, resulting in a long growing season and slow maturation.

In the milling of white flour from wheat, the kernels are ground in roller mills. Roller mills break apart the wheat kernels by a combination of cutting and shearing. The starchy interior portion of the kernel, from which we get flour, is ground more finely than the tougher outer bran coat. The bran is then removed from the flour by sieving.

If we observe wheat flour under a microscope, it can be seen that hard and soft wheats break apart differently during grinding. Wheat kernels are made up of small, individual cells, as are all plant materials. The cell components of hard wheat tend to be held together more strongly than are the components of soft wheats. During milling, the cells in soft wheat tend to be broken apart because of their lack of strength.

When hard wheats are milled, the kernels tend to break between cells, leaving many of the individual cells intact. Because of the difference in the way hard and soft wheats break apart, hard and soft wheat flour feel different to the touch. Hard wheat flour, which contains many intact cells, has a coarse, granular feel. Soft wheat flour, which tends to fracture into smaller particles, has a smoother, "mealy" feel.

ACTIVITY 1

HARD VERSUS SOFT WHEAT TEST

SUPPLIES NEEDED:
Hard wheat flour, such as whole wheat flour, bread flour.
Soft wheat flour, such as cake flour, all-purpose flour.
Dishes or pans to hold flour so that sutdents may handle it.

SUPPLIES PROVIDE*
NONE
* Supplies provided may vary from county to county, check cover letter.

RESOURCES NEEDED BY TEACHER:
Information on hard and soft wheat.

ADVANCE PREPARATION:
Talk to students about hard and soft wheat flour. Prepare pans or dishes of flour.

WHAT TO DO:

Is it hard or soft wheat?
1. Have the students feel the flour.
   Have the students squeeze the flour in their hands. If it holds its shape, it is soft wheat. If it falls apart, it is hard wheat.
2. Have the students rub the flour between their fingers. How does it feel? Hard wheat feels coarse and granular. Soft wheat feels smooth. Flours milled from hard wheat contain firm, elastic gluten. The gluten makes the flour good for yeast bread.

ACTIVITY 2

STARCH TEST

SUPPLIES NEEDED:
Iodine
Flour, could use different kinds, whole wheat, all-purpose, cake, bread.
Small dishes, or pans for testing flour, (might use aluminum foil).
Optional: Other foods containing starch or carbohydrates such as potato, cornstarch, sugar and non-starch foods like salt.

SUPPLIES PROVIDED*:
NONE
* Supplies provided may vary from county to county, check cover letter.

RESOURCES NEEDED BY TEACHER:
Information on starch.

ADVANCE PREPARATION:
Prepare flour, or have supplies handy for children to prepare supplies.

WHAT TO DO:
1. Discuss starch with children, food value, characteristics.
2. Prepare samples of flour for testing, put small amounts of flour in small dishes or in a small pile on foil.
3. Put a few drops of iodine on a sample of flour.
4. Observe what happens.
   (A deep blue color results.) This is a good way to determine if a substance contains starch.
   Optional: Perform the same test using a potato, cornstarch, sugar or salt.
5. What happens? Discuss with children.

CAUTION: DESTROY ALL SAMPLES. Iodine is toxic if ingested in this form!

GLUTEN INFORMATION

The nature and the quantity of protein present in a flour is important in determining baking quality. Flour proteins can be divided into those soluble and those insoluble in water. Flour contains two groups of soluble protein, albumins and globulins, each of which includes several proteins. The soluble proteins can be dismissed briefly because their functions are unknown, except that they are probably related to baking quality. The insoluble protein in flour is GLUTEN.

Gluten can be separated readily from flour by adding water to form a stiff dough and then kneading in water to wash away the other constituents, largely starch. The wet gluten is a cohesive, elastic mass that expands greatly on baking to form a light, porous ball. The gluten is capable of forming the structure of a dough, of holding other constituents such as starch embedded in it and of retaining the leavening gas as it is formed.

Baking the gluten shows that it expands greatly as the steam within it expands, and that it coagulates when heated to form the structure of the baked product.

It has been seen that the protein content of a flour is a factor in determining its baking quality because it is reflected in the amount of gluten that can be formed when the flour is mixed with water. However, high protein content does not always result in good baking quality.

Durum wheat, which has the highest protein content, is used for making spaghetti and macaroni products, not for making bread. Flours high in protein do not produce good bread because their gluten is tough and does not expand. Hard wheat produces the best flour for bread because of the quantity and quality of the gluten that can be formed from it.

PROPERTIES OF GLUTEN

Wheat flour consists primarily of two major components, starch and protein. It is the wheat protein that is responsible for the material we call gluten. Gluten actually consists of two different proteins, one that is very sticky and stringy, and one that is very elastic or rubbery. These two proteins combine together to make the stretchy gluten. Gluten can be prepared by washing wheat flour with water or diluted salt water. The water will dissolve the starch portion of the flour. As the starch is washed away, we are then left with the gluten, which, because of its rubbery nature can be formed into a ball.

It is the gluten that makes it possible to produce leavened bread from wheat flour. As we mix bread dough, it is the gluten that holds the dough together. Then, as the yeast added to the dough begins to ferment, carbon dioxide gas is produced. The carbon dioxide is trapped by the gluten and forms bubbles in the dough. The stretchy gluten acts like a balloon, and the bubbles expand as more gas is produced by the yeast. It is these gas bubbles, trapped by the gluten, that makes the bread dough rise. The bubbles formed by the carbon dioxide are what gives bread its light and open texture.

Only wheat is capable of forming an elastic gluten. The proteins in other cereal grains, such as oats or corn, do not form a stretchy material as does wheat. Breads baked from these grains do not trap carbon dioxide, and therefore do not rise like wheat bread. Breads baked from other cereal grains are much denser and heavier.

ACTIVITY 3

GLUTEN TEST

SUPPLIES NEEDED:
Several types of flour, whole wheat, all-purpose and cake
Mixing bowls
Large pan of water or access to a sink
Baking pan
Aluminum foil
Access to an oven
Optional: rye, soy and/or buckwheat flour

SUPPLIES PROVIDED*:
NONE
* Supplies provided may vary from county to county, check cover letter.

RESOURCES NEEDED BY TEACHER:
Information on gluten.

ADVANCE PREPARATION:
Have supplies ready.
Determine how children will be divided up or if they will work individually.

WHAT TO DO:
1. Form balls of dough from the hard whole wheat flour and the other flours by slowly adding water to 1/2 cup of the flour until a stiff dough consistency is achieved.
2. Knead the dough for a short time. Kneading develops the gluten. Wash the starch from the dough by squeezing gently under a stream of tap water or in a bowl filled with tap water. If a bowl is used change the water several times.
3. Continue washing the dough until it is free of starch. You might save the water from the washing and give it the iodine test for starch.
4. Shape the gluten into smooth balls. How does it look? Does it feel stretchy? How are the balls different? Compare the ones from soft and hard wheat.
5. Bake the gluten balls, if possible, at 450° F. for about an hour. To help the children distinguish between the balls, before baking, cut shapes out of foil on which to place the gluten balls; i.e. one ball could be placed on a round, or square. The heat produces steam. As a result, the gluten expands and then becomes firm.
6. Compare the size, texture and color of each gluten ball.

Optional:

Depending on the resources available, wheat flour gluten balls (hard and soft) could be compared to rye, soy and/or buckwheat flour gluten balls.

ACTIVITY 4

GRINDING WHEAT

SUPPLIES NEEDED:
Wheat
Wheat grinder (an inexpensive grinder resembling a large food grinder) or a blender (wheat grinder available from Wheat Board on loan basis)
Optional: Mortar and pestle, stones
Containers for flour
Sifter

SUPPLIES PROVIDED*:
NONE
* Supplies provided may vary from county to county, check cover letter.

RESOURCES NEEDED BY TEACHER:
Poster depicting milling process

ADVANCE PREPARATION:
Have supplies ready.
Prepare work surface.
Cover or review milling process.

WHAT TO DO:
1. Put a small amount of wheat in a wheat grinder or blender. Have children take a turn at putting in the wheat and turning the handle of the mill, or turning on the blender.
2. Grind a fair amount of flour.
3. Discuss the color and texture of the ground wheat. How is it different from what you see and use at home?
4. Sift the flour and compare the color and texture of the wheat which does not go through the sifter with the flour that is sifted out. What part of the wheat is permanently in the sifted flour? What part of the grain is in the coarser wheat?

Optional:

Explore with the children how early humans ground their wheat. You might have children grind some wheat with a mortar and pestle or between two stones.

A trip to the museum might provide some insight into this aspect of wheat use.

POPPING OF WHEAT

While "popped" corn is familiar to almost everyone, many people do not realize that other cereal grains, including sorghum and wheat, can also be popped. Wheat can be popped by applying heat to the kernels. A wheat kernel normally contains 10 - 15 percent water. As the kernel is heated, this water changes to steam and expands. The outer bran coat surrounding the kernel acts as a barrier to keep the steam from escaping. Since the steam cannot escape, it begins to build pressure inside the kernel. This pressure continues to build until it becomes great enough to rupture the bran coat. When this happens, the steam escapes rapidly from inside the kernel. This rapidly escaping steam causes the starchy part of the kernel to expand, giving the familiar popping effect.

A similar effect is used to produce "puffed" wheat breakfast food. To make puffed wheat, the wheat kernels are cooked in water in a large pressure cooker. The pressure inside the cooker forces the hot water into the wheat kernels. Then the pressure is released very rapidly. When this happens, the water in the kernels vaporizes and expands. This rapid expansion of the steam causes the starchy part of the kernel to also expand rapidly, giving the familiar "puffed" appearance to the wheat kernels.

ACTIVITY 5

POPPING WHEAT

SUPPLIES NEEDED:
1 Quart clean wheat
3 Quarts water
Cooking pot with lid to hold water and wheat
Electric frying pan
Absorbent paper towel
Flavored salt (onion, garlic, cheese or combination) or plain salt
Shortening
Slotted spoon

SUPPLIES PROVIDED*:
NONE
* Supplies provided may vary from county to county, check cover letter.

RESOURCES NEEDED BY TEACHER:
Popping of wheat information.

ADVANCED PREPARATION:
Bring water to boil. Add wheat. Cover and remove from heat. Let stand until swollen (about 1 hour). Rinse with cold water. Drain thoroughly. This may take 45 minutes to 1 hour as there should be no water dripping from it.

SAFETY NOTE: MAKE SURE WHEAT IS WELL DRAINED AND NOT WET SO THAT IT WILL NOT CAUSE THE FAT TO SPATTER.

WHAT TO DO:

1. Fry wheat in shortening heated to 350° F. until crisp and light brown in color.
2. Remove with slotted spoon (or other appropriate utensil) and drain on absorbent paper towel.
3. Season with any flavored salt or plain salt.

THICKENING PROPERTIES OF WHEAT FLOUR

The thickening properties of wheat flour are due to the starch present in wheat. All cereal grains, including wheat, contain large amounts of starch. Wheat kernels or whole wheat flour normally contain over 50 percent starch, while white flour often contains more than 65 percent starch. By observing wheat flour under high power microscopes, scientists have been able to determine that the wheat starch is present as tiny spherical-shaped granules.

When wheat flour or starch is added to cold water, the starch will absorb small amounts of the water, but will have little effect on the viscosity or "thickness" of the mixture. Howver, if heat is applied to the starch/water mixture, very noticeable changes soon take place. As the temperature increases, the mixture will become much thicker. This is due to a change that occurs in the starch granules called gelatinization. When heat is applied in the presence of large amounts of water, the starch granules begin to swell and absorb the water. Each granule can absorb several times its own weight of water, and will swell to several times its original size. The mixture becomes thicker because much of the water is now absorbed. Also, the large, swollen granules are more likely to bump into each other than are normal size granules, thereby making the mixture harder to stir.

Starches obtained from wheat, corn, or other grains are used widely as thickeners in many different types of foods. Examples include the use of wheat flour to thicken gravies, and the addition of starch to fruit pie fillings and puddings to make these products firmer and more acceptable to consumers.

ACTIVITY 6

GELATINIZATION/THICKENING TEST

SUPPLIES NEEDED:
Water
Flour
Saucepan
Measuring cups
Measuring spoons
Mixing spoon such as a wooden spoon
Custard cups or other similar small dishes
Heat source for cooking gel

SUPPLIES PROVIDED*:
NONE

* Supplies provided may vary from county to county, check cover letter.

RESOURCES NEEDED BY TEACHER:
Information on thickening properties of wheat flour

ADVANCE PREPARATION:
Have flour and supplies ready for children. You might want to measure out water and flour in advance.

WHAT TO DO:

1. Discuss with the children the thickening properties of wheat flour.
2. Prepare a gel.
3. Measure out 1/4 cup flour and 1 cup water.
4. Put the flour in the sauce pan and slowly add the water.
5. Mix it until there are no lumps.
6. Cook over heat, stirring constantly but not vigorously until the mixture thickens.
7. Remove from heat and pour into a small dish.
8. Observe the gel and discuss with the children.
9. After the gel has cooled, observe and discuss again.

Optional:

You might try the same experiment using different amounts of flour and different starches like cornstarch, cake flour, tapioca.

ACTIVITY 7

HOW YEAST MAKES BREAD RISE

Yeast uses sugars in the bread dough to produce carbon dioxide. This activity will allow the students to identify the carbon dioxide produced by the yeast.

Supplies needed:

Sugar
Dry Yeast
Very warm water
Empty soft-drink bottle
Balloon
Drinking glass
Limewater

WHAT TO DO:

Place about a teaspoonful of sugar and about a half teaspoonful of dry yeast in a clean soft-drink bottle. Pour two or three inches of warm water into the bottle. Shake the mixture gently.

Attach the mouth of a balloon over the top of the bottle. Leave the bottle in a warm place. Observe what happens as the yeast cells act on the sugar.

Wait one hour then fill the drinking glass with fresh limewater. Pinch the balloon just above the neck of the bottle. Remove the balloon from the bottle, being careful not to lose any of the gas. Place the closed neck of the balloon below the surface of the limewater. Release the gas into the glass of limewater. Squeeze the balloon if necessary. Observe. Carbon dioxide reacting with limewater will produce calcium carbonate which makes the water cloudy.

QUESTIONS:

Describe what happened in the bottle during the hour.

What is the limewater used as a test for?

Was this substance in the balloon? How do you know?

Students should work in pairs or in groups of three. Have them note any changes they see occurring with the balloon in their notebooks.

ACTIVITY 8

WHAT IS A GOOD FOOD SOURCE FOR YEAST CELLS?

Since the yeast and sugar reactions produce carbon dioxide. The next step is to try and determine what is a good food source for the yeast plants. In doing so, a simple task in biochemistry is required. A biochemist is a scientist who studies the chemistry of living things. This activity involves substrates. A substrate is any material used by yeast for food. The most common substrate is glucose.

SUPPLIES NEEDED:

Yeast	4 large balloons
Syrup	2 glasses
Flour	4 quart bottles
Unflavored Gelatin	Funnel
Grape Juice	String
Tablespoon	Notebook

WHAT TO DO:

Number the bottles with a grease pencil or with masking tape.

In one of the glasses, make up the yeast solution. The yeast can be in dry or cake form. Follow the directions on the package, except use **three packages** or cakes in one cup of warm water for yeast solution. Be sure to use all the same kind of bottles.

In the second glass put a half cup of corn syrup and four tablespoons of the yeast solution. Mix thoroughly and, through the funnel, pour into the first bottle. Label the bottle "Corn Syrup" and note the time and date.

Wash out the glass and funnel. Next, mix a half cup of flour and a half cup of water in the glass and add four tablespoons of yeast solution. Mix well and put into the second bottle. Label.

Wash out the glass and funnel again and make a gelatin solution according to the directions on the package, which will probably be one tablespoon of powder to a half cup of water. Add four tablespoons of the yeast solution and pour into third bottle. Label.

Wash out the glass and funnel. Pour in a half cup of grape juice and add four tablespoons of yeast solution and stir. Pour this into bottle four and label.

Place a balloon over the mouth of each of the bottles and tie a string around the neck of the bottle firmly so nothing can get in or out of the bottle. Lay all of the bottles on their sides in as warm a place as you can find (about 85°F is ideal).

****NOTE** The four food mixtures made up in this investigation represent four different types of food. The syrup is mostly a sugar that has been partially processed. Flour is high in starch. Protein is represented by the gelatin. Grape juice has a high percentage of natural sugar.

Be sure to note the time and temperature of each bottle at the beginning of the investigation.

After half an hour observe the bottles. Note any changes. Be sure to note the time, temperature, condition of the bottle and the balloon whenever you make your observation.

After another half hour passes, turn the bottles upright and swirl the liquid inside to mix it as thoroughly as you can. This brings new food to the yeast plants and will help them grow.

QUESTIONS:

Which food source seems to have the greatest effect on the yeast?

Which has the least?

What kind of gas is being produced?

Why must the conditions be the same for all four of the bottles?

What is the variable in this investigation?

What conditions are necessarey for the yeast cells to grow?

This investigation can be repeated using other food substances. The following could be used: milk, tomato juice, soup, corn starch, molasses, and vege-

table oil. You might be able to think up more on your own.

ACTIVITY 9

WHAT "CHEMICALS" ARE HARMFUL TO YEAST CELLS?

SUPPLIES NEEDED:

Yeast	4 bottles
Vinegar	Tablespoon
Laundry bleach	4 balloons
2 glasses	Funnel
Ammonia	Notebook
Teaspoon	

Do not mix the above household ingredients together.

WHAT TO DO:

Make up a cup and a quarter of the mixture that you found to be the best food for the yeast plants in Activity 8. Put a quarter cup of this food into each of the bottles.

Next make up the yeast solution as you did before. Add two tablespoons of the yeast solution to each of the bottles as before and stir. Label the bottles as before and keep a record of what you put into each bottle.

Bottle 1: Add nothing to the food and yeast that's already in the bottle. This bottle is your "control" and will be used later to compare to the other bottles.

Bottle 2: To the food and yeast, add one tablespoon of vinegar and stir.

Bottle 3: To the food and yeast, add one tablespoon of ammonia, and stir.

Bottle 4: To the food and yeast, add one tablespoon of bleach and stir.

Tie the balloons in place and put the bottles in the same warm place.

Check the progress of the investigation every half hour. Be sure to record the time, temperature, and the condition of the solutions in each bottle. Every time you observe the bottles, twirl the bottles as before to mix the contents.

QUESTIONS:

Which bottles show no change in the balloon when compared to the control?

Do any of the balloons seem to be collecting carbon dioxide?

Which ones?

This investigation can be repeated using other chemicals. The following can be used: rubbing alcohol, turpentine, milk, tea, coffee, soap.

ACTIVITY 10

HOW DO YEAST CELLS DIVIDE?

SUPPLIES NEEDED:

Yeast	Glass slides
Warm water	Cover slips
Microscope	Iodine
Medicine dropper	

WHAT TO DO:

Make up a yeast solution according to the directions on the package. Place a small drop of the solution on a glass slide. Stain with iodine. Put a cover slip on the slide. Have students observe the yeast cells under the microscope. Look for individual cells that seem to have a small bubble on the side. This protrusion is the yeast cell reproducing itself by the process of budding. Students should make drawings in their notebooks.

NOTES

The earliest experiments on budding were conducted by a French scientist, Cagniard de la Tour. de la Tour viewed budding under his microscope in 1857. He also noted a relationship between yeast and sugar.

Some years later, Louis Pasteur proved the theory of fermentation. Pasteur was able to show that fermentation of every kind was caused by a living thing.

Nebraska Cooperative Extension Service 4-H 216

WHEAT PRODUCTION AND MARKETING

UNIT 3

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

PURPOSE

To help students gain an understanding of the wheat production cycle and the people involved from the seed to the finished product. This unit will include 1) plant growth, 2) grain marketing, 3) the milling process and, 4) careers involved in this industry.

SUMMARY OF LEARNING ACTIVITIES

Activities within this unit will allow students to work in small groups to examine various agricultural practices involved in wheat production. Students will also trace the flow of the grain from the farm to its final destination. They will also be able to investigate potential career options as they work their way through the unit.

OBJECTIVES

The student will be able to:

1. understand the different growth phases in wheat and compare the different types of equipment needed for each of the major stages.
2. follow the grain from the farm to its final destination through the marketing system.
3. learn what happens to the wheat kernel from the time it enters the mill until it attains a form suitable for human consumption.
4. know what careers exist in these industries that may be of future interest to the student.

VOCABULARY

seed
tillering
drill
bin
yield
elevator
cooperative
truck
vernalization
ripening
barge
port
shoot
heading
tillage
combine
bushel
unit train
transportation

LIST OF ADVANCE PREPARATION AND SUPPLIES NEEDED

Activity III-1

1. Obtain farm magazines from your own source or contact the extension office.
2. Provide paper and glue for fixing pictures to a poster for display of the different agricultural implements.
3. Duplicate the diagram of the combine as needed.
4. Provide a method of disposal for the threshed wheat heads.

Activity III-2

1. Provide potting soil for planting the wheat. Students may use their bread pans after the bread making activity for a pot.
2. Growing plants will need a warm sunny location to grow for several weeks before vernalization.
3. For a long term project a cool place must be arranged for the wheat to vernalize.

Activite III-3

1. Obtain the use of mortar and pestle units for the students to grind the wheat. Additional wheat will be provided by the extension office.

Activity III-4

1. Duplicate the handout on careers if you would like the students to have a copy for ideas.

LIST OF SUPPLIES PROVIDED BY THE LOCAL EXTENSION STAFF IN THE CLASSROOM KIT

Farm magazines (by request only)
Wheat heads
Diagram of combine
NebGuides on wheat production
Chart on growth stages of wheat
Wheat seed for planting or grinding
Copy of Careers Involved in Market Structure of Wheat

ACTIVITY III-1
SEED TO HARVEST

1. Students will prepare a calendar of the activities that occur on the wheat farm from the time the wheat is planted until harvest.
2. Students will browse farm magazines and select pictures and articles that are related to the production of wheat and prepare a pictoral display in the order that the machines might be used in the wheat production cycle.
3. Have students study the cut-away diagram of a modern combine and identify which parts do the threshing, separating, and cleaning.
4. Have students take one head of wheat from the classroom kit and roll the head between their hands. Have the students discuss how this compares with the operation of a combine.

ADDITIONAL INFORMATION FOR TEACHERS

When students are preparing the calendar of activities on a wheat farm this may be an excellent time to have a farmer come to the class as a guest speaker. The basic activities that students should include in their calendars are some type of tillage operation before planting, the drilling (planting) of the wheat in the fall, and harvest the following summer. Many of the field operations are listed in the NebGuides that are included in the kit. Many of the NebGuides also refer to fallowing, leaving the land lay idle for a year to accumulate enough moisture to raise a crop the following year. This is not a common practice in Eastern Nebraska but is used extensively in Western Nebraska where rainfall is limited.

Have the students look through numerous agricultural magazines to find the pictures for a display. They may need to do this as a group activity so that they can discuss the different machines as they are reading the magazines.

After the students have discussed the diagram of the combine allow them to hand thresh a head of wheat. This can be accomlished by:

1. Placing the head between both hands with the palms in a horizontal position and moving their hands backwards and forwards repeatedly while applying pressure. This is similar to the threshing action in a combine.
2. After the grain has been "threshed" out of the head the student can shake the parts in the palm of one hand letting the bigger and lighter parts of the head float to the top and the heavier grain kernels settle to the bottom. The students can now skim the empty spike and some of the hulls off to the side and discard. This is similar to the separating action of the combine by the straw walkers and sieves.
3. The students can now clean the chaff from the grain that remains in their hands. A combine completes this job by blowing it out of the rear of the combine. Have the students stand near a waste paper basket and pour the grain from one hand to the other while blowing lightly on the material as it drops through the air from one hand to the other.
4. Discuss these activities as they are occurring. Remember that the trip through the combine for the seed head only takes about 15 seconds, and that there are thousands of heads going through the combine at the same time. As an additional discussion topic you may want to compare this to the way wheat was threshed before modern machinery. At that point, in history farmers would have livestock walk on the wheat heads on a hard surface to thresh the grain out of the heads, separate the straw and spikes by hand, and then throw the grain and chaff up into the air for the wind to blow the chaff away.

ACTIVITY III-2
PLANT GROWTH

1. Students will discuss the growth phases of a wheat plant and try to estimate the time of the year in which they might occur.
2. Allow students to plant wheat seeds in a container or they may use the bread pan after the bread making exercise. Allow the students to research plant growth in the school library.
3. If a long range project is desired, the wheat that is planted in the classroom can be grown until the end of the school year to watch it head out.

DISCUSSION INFORMATION

The approximate dates for growth stages will vary from year to year with different weather conditions. The following is an estimate for Southeast Nebraska.

Stage 1	Late Sept.-Early Oct.
Stage 2-5	These vegetative growth stages will occur throughout the fall until snow and cold weather prevent any further growth. The wheat will stay green approximately as long as the bluegrass in the urban lawns.
Stage 6-8	Late March - April
Stage 9	Early to mid May
Stage 10	Mid May

Stage 11 Mid June Harvest will follow in several weeks after the grain has reduced its moisture content

PLANTING EXPERIMENT

The planting of wheat seeds can take two directions in the classroom. If a short term project is desired, the students can plant the wheat seed provided with the students' materials and observe the growth that takes place during the first two weeks. Students may want to experiment with the amount of water that it takes to germinate the seeds. They may want to water one pot regularly and keep the soil moist, keep another very wet and observe what happens to the seeds in very wet soils, water another once and see what can happen when it does not "rain" often enough, and lastly not water one pot at all.

If a longer term experiment is desired, the students may grow the wheat plants until they have at least seven leaves. It will then be necessary to vernalize the wheat plants. This is the natural process that winter wheat must go through to convert from vegetative fall growth to reproductive growth in the spring. This process can be simulated by placing the container with the plants in a cool place that is near or below freezing for several weeks. The plants can then be moved to a warm location to observe typical spring growth.

NOTE - wheat may not respond normally under classroom conditions due to differences in day length from what would normally be typical in a farm field. Over or under watering may also increase the number of plant diseases over what would be normal under field conditions. Once the weather outside warms up the wheat could be moved outside to observe what plants must go through under natural conditions.

ACTIVITY III-3 MILLING

1. Students will learn about the processes that a kernel of wheat must go through to reach the point of being ready for use in human consumption.
2. Students will recognize what parts of the wheat are being separated throughout the process and what are the uses for these end products.
3. Students may have the opportunity to grind a few wheat kernels by hand in a mortar and pestle and then identify the parts of the kernel after they are broken apart.

Have the students study the poster on the milling process and select a machine that they would like to talk about in front of the class. The students may then line up around the perimeter of the room and tell about their machine and what it does and where the wheat goes after they have process it. The next machine (student) will then tell what it does to the wheat, etc.

Students may try to grind some kernels of wheat in a mortar and pestle. This is the method that was used hundreds of years ago when a stone was used to break up the wheat kernels for use in making foods. After the students have ground the wheat for about a minute, have them try to identify the different parts of the wheat kernel. Compare this method to the modern milling methods of today. How are they different?

ACTIVITY III-4 CAREERS

1. Students will identify the different careers and people that are involved from the seed to sandwich.
2. Students will speculate about what other careers may support the primary roles.

Have the students discuss as a class the roles that people play in the process of getting the wheat from the seed to the sandwich. Use the chalkboard or series of paper sheets posted around the room to identify these roles where everyone can see them. After all the roles have been identified list support roles under each of these careers.

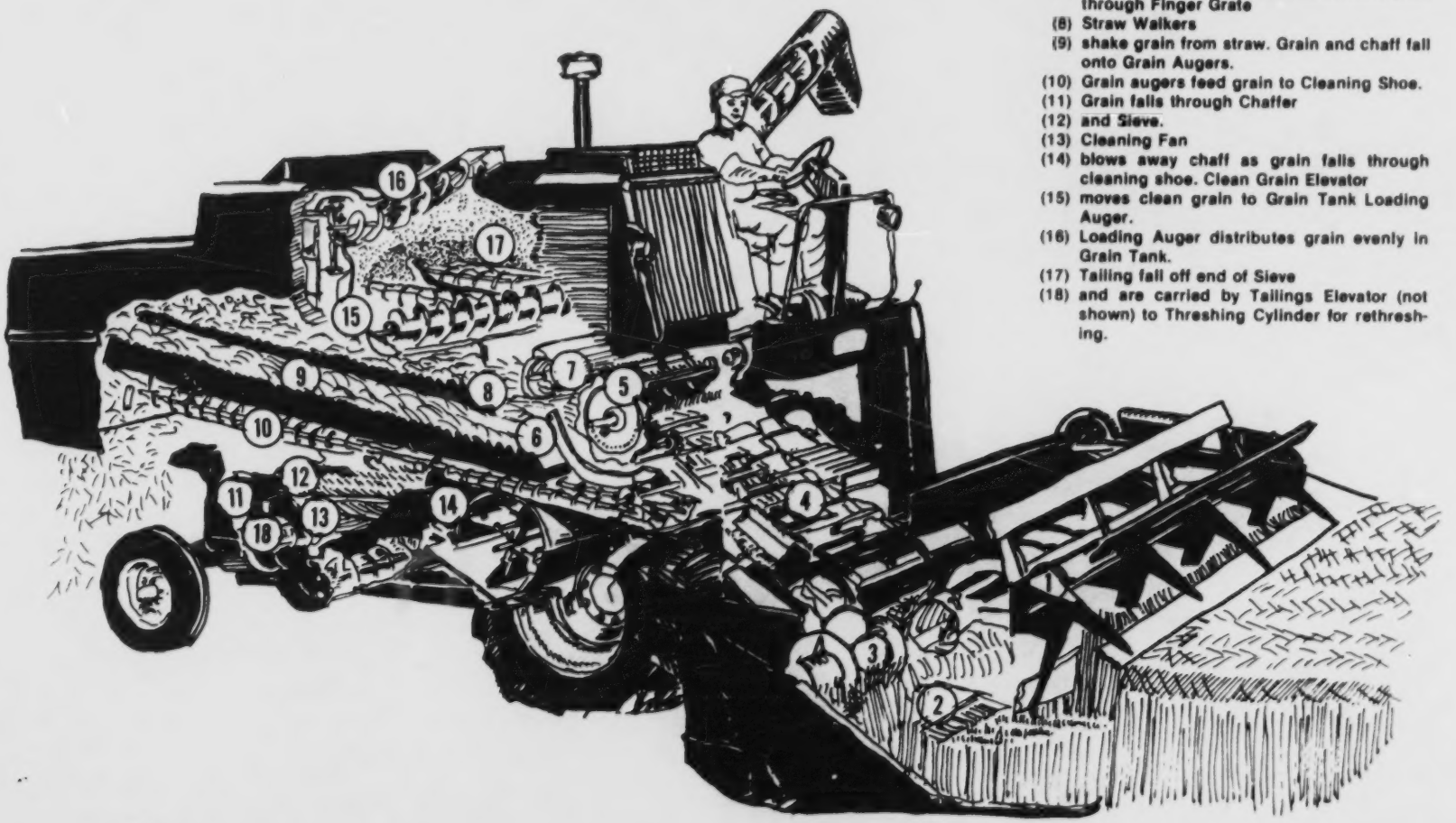
Example:

Farmer	-> Trucker	-> Elevator manager	-> etc
Mechanic	Gas station attendant	Electrician	
Fertilizer dealer	Mechanic	Weighmaster	
Welder	Road repairman	Marketing manager	

Have the students indicate which careers they might be interested in and why they would like to do that.

Enclosed in the classroom kit is a sample of some of the careers involved with the market structure and production of wheat. See how many additional careers your class can add to the list.

STUDENT ACTIVITY SHEET



BASIC COMBINE OPERATION

The Reel
(1) holds crop against Cutterbar
(2) Cutterbar cuts crop. Reel pushes crop into path of Auger
(3) Auger moves crop to Feeder Conveyor
(4) Feeder Conveyor delivers crop to Threshing Cylinder
(5) Threshing Cylinder and Concave
(6) thresh crop. Rotary Deflector
(7) strips straw from cylinder and deflects grain through Finger Grate
(8) Straw Walkers
(9) shake grain from straw. Grain and chaff fall onto Grain Augers.
(10) Grain augers feed grain to Cleaning Shoe.
(11) Grain falls through Chaffer
(12) and Sieve.
(13) Cleaning Fan
(14) blows away chaff as grain falls through cleaning shoe. Clean Grain Elevator
(15) moves clean grain to Grain Tank Loading Auger.
(16) Loading Auger distributes grain evenly in Grain Tank.
(17) Tailing fall off end of Sieve
(18) and are carried by Tailings Elevator (not shown) to Threshing Cylinder for rethreshing.

Careers Involved In Market Structure For The Production and Marketing of Wheat

A list of businesses and professions involved in the complex economic system that produces wheat and its many end products more efficiently and economically than anywhere in the world.

Seed Production

- Research - Plant Breeder, Experimental Farm Manager, Experimental Milling & Baking by University and USDA Scientists
- Seed Production - Grower, State Crop Improvement Association, Seed Cleaning, Firms, Seed Treatment and Chemicals
- Seed Marketing - Producer, Seed Companies, Seed Salesmen, Transportation, Storage

Wheat Production

- Grower
  - Landlord, Land Owner
  - Farm Machinery Supplier - Manufacturer, Dealer
  - Irrigation Equipment Supplier
  - Supplier of Fuel, Tires, Batteries, etc.
  - Supplier of Fertilizer - Manufacturer, Dealer
  - Custom Spreading Equipment
  - Ag Chemical Supplier for seed control
  - Custom Combine Operator
  - Transportation, Truck
  - Insurance Crop - Local Agent, Company, U.S. Government
- Trade Association - Wheat Growers Association, U.S. Wheat Growers Association, The Wheat Quality Council

Wheat Storage

- Grower - On Farm
  - Suppliers of storage bins and handling equipment such as augers, elevators
  - Suppliers of aeration and drying equipment
  - Sanitation technicians, management, research
  - Suppliers of chemicals for insect control and equipment for application such as sprayers, probes, etc.
  - Suppliers of temperature monitoring equipment
  - Commercial storage - country elevator, terminal elevator, port elevators, subterminal elevators

Wheat Marketing

- Grain Buyer - Country Elevator, Subterminal, Terminal, and Flour Mill
- Grain Broker
- Grain Merchandisers
- Grain Inspection - State Grain Inspection Department, FGIS, USDA, Private Agencies and Personnel
- Grain Elevator Operating Personnel - Manager, Superintendent, Laborers, Office Personnel, Grain Grader,

	Maintenance, and Accounting
Board of Trade	- Futures & Cash Markets, Kansas City, Chicago and Minneapolis
Grain Standards	- USDA
Research - USDA	- Grain Marketing Research Center, Universities Economic & Marketing
Trade Association	- Nebraska Wheat Board U.S. Wheat Associates National Grain & Feed Association Grain & Feed Association
Grain Market Statistics	- Crop Reporting Service USDA - Crop & Livestock Reporting Service Economic Research Service Foreign Agricultural Service (FAS)
Grain Marketing Programs	- USDA - PL 480 Sales of Wheat & Flour USDA - ASCS Price Support Program County, State, National
Financial	- Local Bank PCA, FLB, Bank for Cooperatives National & International Banks U.S. Government - Guaranteed Payment on Export Sales
Grain Market News	- Newspaper, Trade Papers, Magazines, Radio, Television, Trade letters, Computer Terminals, Telex (Grain Instant News)
Transportation	- Truck, Barge, Ship, Rail
Wheat Utilization-Flour Milling	- Buyer Elevator - Storage, Cleaning, Blending Milling - Superintendent, Laborers Laboratory - Cereal Chemist, Lab Personnel Packaging - Bag Supplier, Equipment Supplier Salesmen Management Office Personnel Transportation - Truck Rail Water Maintenance & Repair Personnel Sanitation - Suppliers of Chemicals and Equipment Service Firms US - FDA
Baking - A. Commercial	Buyer - Flour and other ingredients, package materials

	1. Bakery-Nutritionist	Quality Control Supervisor Superintendent Operating Personnel Engineer Maintenance & Repair General Manager Office Personnel Accounting Personnel Manager Salesmen Route Drivers Advertising & Promotion Financing Sanitation - A.I.B., Private Firms
	2. In-Store	
	B. Institutional	Schools Hospitals Retirement Homes Cereal and other food manufacturing Industrial Uses Formula feed manufacture
Retail Market	- Supermarket	- Buyer Store Manager Bakery Department Manager Sales personnel
	Local Bakery Franchise Bakery	
Other Supporting Activities	- 1. Education	- University - Dept. of Grain Science & Industry Community Colleges Vocational Schools A.I.B. Primary, Secondary Schools Trade Associations
	2. Regulatory	State Agriculture Department Weights & Measures Health U.S.D.A. F.D.A Sanitation, Nutrition Standards
	3. Clerical & Accounting	Secretarial Business Machine operators Computer personnel Sales Service Management
	4. Communications	Telephone Telex Mail Room
	5. Weather Forecast	U.S. Weather Service Private Weather Forecasters News Media Radio Television Newspaper

Robert W. Schoeff
June 1982

Nebraska Cooperative Extension Service 4-H 217

CONSUMER EDUCATION AND NUTRITION

UNIT 4

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

PURPOSE

To create an awareness of the value of wheat products to a healthy body.

To create an awareness of the large variety of wheat flours available in our grocery stores and the uses of specialty wheat flours.

SUMMARY OF LEARNING ACTIVITIES

1. Discussion and small group activity to compare nutrients in wheat foods.
2. Learn the variety of wheat flour in the grocery store through a field trip or an independent trip with parents.

OBJECTIVES

Students will be able to:

1. Identify the nutrients in wheat cereals, pasta, breads and crackers.
2. Define how these nutrients are important to good health.
3. Recognize the variety of wheat flours and their uses.

VOCABULARY

Carbohydrates
Fiber
Protein
Fat
Thiamin
Riboflavin
Niacin
Iron
Zinc

ACTIVITY IV-1 READ THE LABEL

LIST OF ADVANCED PREPARATION AND SUPPLIES NEEDED:

Copies of sample activity sheet 1 **or**
Copy for the overhead projector
Students should bring: cereal boxes, bread wrappers, pasta containers and cracker boxes to class.

SUPPLIES PROVIDED

Master copy of sample activity sheet 1

RESOURCES NEEDED BY TEACHER

Refer to the background information at the conclusion of this unit.

"Nature's Best - Wheat Foods"
Wheat Foods Council

"Wheat Foods...The Natural Choice"
Nebraska Wheat Board

"Your Money's Worth in Foods"
USDA
Prepared by Human Nutrition Information Service
Home & Garden Bulletin Number 183

"Learn from the Food Label" D-10
NebGuide HEG82-160

"Inside Wheat Foods"
So Few Calories, So Much Variety, So Much Nutrition

"Grains as Food"
Nebraska Cooperative Extension Service EC 84-408

"Facts About Fiber"
Wheat Foods Council
Nebraska Wheat Board

WHAT TO DO

1. Pass out the sample of Nutrition Information from Wheat Chex or make a copy for the overhead projector.
2. Discuss, in general terms, the nutrient information on the label. Explain Percentage U.S.R.D.A.
3. Hand out to each student the list of nutrients in wheat. Have the students find the percent of U.S.R.D.A. of each nutrient found in wheat as shown on the sample chart. Discuss.
4. Divide class into groups of 3 or 4.
5. Distribute wrappers and boxes that students have brought to share. For example, one group has a variety of bread labels, another has a variety of cereal labels, etc. Distribute one copy to each group the material from "Inside Wheat Foods", Bread, Pasta, Cereals, Crackers.
6. Distribute Activity 1, Sheet 2 so there are enough for each label in the group.
7. Fill out one of Activity 1, Sheet 2 for each product.
8. Have students determine if one wheat product is higher in nutrient value than another.
9. Each group should have a spokesperson to share the information gathered.
10. General discussion should follow about the wheat products students could use to have a good start to their day.

Sheet A

SAMPLE CHART
ACTIVITY 1

	1 OZ. WHEAT CHEX	1 OZ. WHEAT CHEX PLUS 1/2 CUP VITAMIN D FORTIFIED WHOLE MILK
Calories	100	180
Protein	3 g.	7 g.
Carbohydrates	23 g.	29 g.
Fat	0 g.	4 g.
Sodium	200 mg.	260 mg.
Potassium	115 mg.	300 mg.
Percentage of U.S. Recommended Daily Allowances (U.S.R.D.A.)		
Protein	4	10
Vitamin A	*	2
Vitamin C	25	25
Thiamin	25	30
Riboflavin	4	10
Niacin	25	25
Calcium	*	15
Iron	25	25
Vitamin D	*	15
Vitamin B_6	25	25
Folic Acid	25	25
Vitamin B_{12}	25	30
Phosphorus	8	15
Magnesium	8	10
Zinc	4	6
Copper	6	6

* Contains less than 2 percent of the U.S.R.D.A. of these nutrients.

Each serving contains 2g. dietary fiber including 0.6g. (2% by weight) Non-Nutritive Crude Fiber.

Sheet B

STUDENT CHECKLIST - ACTIVITY 1

NAME OF PRODUCT	% R.D.A.**	1 SERVING
_____		
Carbohydrates	_____	_____
Fiber*	_____	_____
Protein	_____	_____
Thiamin	_____	_____
Riboflavin	_____	_____
Niacin	_____	_____
Iron	_____	_____
Zinc	_____	_____
Magnesium	_____	_____

NOTE: Amount of nutrient may be listed in both or only one column.
** Percentage of U.S. Recommended Daily Allowances
* May not be listed on every product

ACTIVITY IV-2 GROCERY STORE FIELD TRIP

OPTION 1 - Arrange a trip to the local grocery store: If the school is within walking distance of a grocery store plan a walk to find out how many types of wheat flour can be found in the store.

(The teacher should contact the store in advance to arrange the visit) If some specialty flours are not found at the store the other flours could be purchased and brought in from another store.

OPTION 2 - Students can take a weekend trip to the grocery store with a parent to see how many of the wheat flours could be found in the store. Give them the activity sheet with the letter to parents in advance.

SUPPLIES NEEDED

Copies of "Activity Sheet for Trip to Grocery Store"
Copies of "Parent Letter" (Option 2)

SUPPLIES PROVIDED

Master copy of Activity Sheet and Parent Letter.

RESOURCES NEEDED BY TEACHER

Refer to the background information at the conclusion of this unit.

"Nature's Best - Wheat Foods"
Wheat Foods Council

"Wheat Foods...The Natural Choice"
Nebraska Wheat Board

"Your Money's Worth in Foods"
USDA
Prepared by Human Nutrition Information Service
Home & Garden Bulletin Number 183

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Nebraska Cooperative Extension Service EC 84-408

"Facts About Fiber"
Wheat Foods Council
Nebraska Wheat Board

ACTIVITY IV-2 FIELD TRIP TO GROCERY STORE

Discuss the different types of flour the students might know. After they have shared their knowledge put chart (or student copy) up which shows the many varieties of flour. Read and discuss the chart (student copy).

Distribute Activity Sheet for the Trip to Grocery Store. Explain to students how it is to be filled out.

Take the trip.

On return to the classroom discuss the varieties that were found at the store. Discuss why others might not have been found.

Review the uses of the different varieties.

DISCUSSION ON A FRIDAY OR LAST DAY OF THE WEEK

Discuss the different types of flour the students might know. After they have shared their knowledge put chart (student copy) up to show the many varieties of flour. Read and discuss the chart (student copy).

Distribute Activity Sheet for the Trip to the Grocery Store. Explain to the students how it is to be filled out. Hand out letter to the parents.

DISCUSSION ON MONDAY OR FIRST DAY OF THE WEEK

Share the different varieties of flour the students found in the grocery store and at home.

Review the uses of the different variety of flours.

_____

Date

Dear Parent/Guardian,

As part of our activities in the unit on uses of the varieties of wheat flour, it will be necessary for your son/daughter to obtain information at your grocery store.

Attached is the activity sheet that should be used to complete the activity. Many of these flours can be found in your grocery store and others can not. Check off as many as you can find and return on _____.

Optional: List the varieties of wheat flour you use at home.

Thank you for your cooperation.

Sincerely,

_____

Teacher

_____ _____

Due Date Name

ACTIVITY SHEET FOR TRIP TO GROCERY STORE

	STORE	PRICE	BRAND
All Purpose Flour			
Enriched All Purpose	_____	_____	_____
Bleached Enriched All Purpose	_____	_____	_____
Unbleached Enriched All Purpose	_____	_____	_____
Bread Flour	_____	_____	_____
Cake Flour	_____	_____	_____
Self-Rising Flour	_____	_____	_____
Pastry Flour	_____	_____	_____
Gluten Flour	_____	_____	_____
Semolina	_____	_____	_____
Farina	_____	_____	_____
Whole Wheat Flour	_____	_____	_____
Pasta Flour	_____	_____	_____

WHEAT

Family: *Gramineae*

GENUS SPECIES: *Triticum aestivum*

History and Botany

Wheat belongs to the great family of grasses. It is the most widely grown and used grain in the world. A thousand varieties are grown commercially. They belong to the classification "Triticum vulgare" meaning common wheat. The kernel of wheat is a storehouse of nutrients needed and used by humans since the dawn of civilization. It was probably grown first in southwestern Asia and introduced into the New World by Columbus in 1493. It was the staple food of the Egyptians, Greeks, Assyrians, and Romans. The invading armies of Alexander introduced it to northern India. Bulgur wheat, sometimes called parboiled wheat, is whole wheat that has been cooked, dried and partly debranned. It has been used in the Near East since Biblical days.

Availability, Processing, and Storage

Wheat is milled into flour. This flour is the basis of food in many forms—bread, rolls, crackers, biscuits, muffins, pancakes, breakfast cereals, macaroni, spaghetti, and noodles. *Whole-wheat flour,* entire wheat flour or graham flour are all names for flour ground from the entire kernel so that the natural constituents of wheat are all present.

Wheat flour results from the milling (removal of bran and germ) and the sifting of clean wheat. This initial product is called "unbleached flour." All white flour is "enriched," i.e., thiamin, niacin, riboflavin, and iron are added at a level set by law to approximate the original levels in whole wheat.

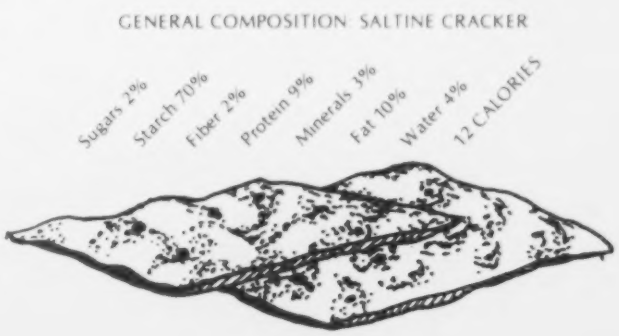
The bulgur form of wheat can be cooked as whole granules or it is "cracked" into fragmented form. Whole wheat grains and bulgur store well for long periods, but whole wheat flour tends to get rancid in hot weather. To prevent rancidity, persons who use whole wheat products, as in India, grind their flour fresh daily or at frequent intervals. White flour will keep well for longer periods. The nutrient composition of wheat varies slightly in different kinds of wheat. By comparing whole wheat and white flours, one can see that with enrichment they are very similar in value. Whole wheat still has the bran (or fiber) and contains slightly more protein than milled white flour. However, that bran may trap the vitamins, and one of its components, phytate, ties up the minerals. In effect, people may get more nutrient value from white flour products than from whole wheat.

Cooking Characteristics

Wheat flour is unique. Of all the grains, only wheat contains the two proteins, gliadin and glutenin, in just the right proportions so that when liquid is added to flour, and the mixure is kneaded, gluten is developed. It is gluten that gives baked products their porous structure and enables batters and doughs to hold the leavening gas that makes them light.

Bulgur may be used as an alternate for rice in many recipes. It can be used as a hot, cooked cereal for breakfast; as a side dish with meat or fish; in bread products; or in main dishes, casseroles, or meat loaf.

Cooking methods for bulgur are similar to those for rice. Like rice, bulgur is not washed before cooking or rinsed after cooking. Cook in just the amount of water that will be absorbed during cooking, i.e., 2 cups of water for 1 cup bulgur. Add bulgur and 1/4 tsp. salt to boiling water. Stir slightly until boil returns. Cover tightly, lower the heat, and allow it to cook 25 min.



Crackers

Crackers really started out as unleavened bread. During the Exodus, the Jews had to flee Egypt before their bread could rise, and the resulting matzoh, or cracker, became a staple carried forward to modern times.

The American cracker began as a major convenience food for our seafaring ancestors. Those who sailed the ships needed a type of bread or biscuit which would not get stale or rancid or disintegrate during long voyages. The answer to this need was hardtack, also known as ship's bread or pilot biscuits. These foods were handmade, hard-baked biscuits produced from light flour and a little moisture. The dough was pounded to produce a biscuit so hard that it often required a hammer to break. This biscuit also found its way overland with the wagon trains and trailblazers of our country.

The cracker segment of the baking industry grew from its origins in the 18th century as did the rest of American industry, but it remained localized throughout the country until the turn of the twentieth centry.

At that time, Adolphus E. Green shook up the entire industry and laid the foundation for the modern, efficient baking industry of today. He was the first to abandon the old barrel and supply fresh, whole crackers in triple-wrapped packages.

Makin' and Bakin'

Today's cracker industry is a modern, efficient, and sanitary food production operation. From the time raw materials arrive at the bakery until finished product leaves, the entire process is fast and highly automated. Formulations are developed specifically for high-speed equipment and also to yield finished products which taste good, have good texture and appearance, and retain these properties for many months.

Crackers certainly come in many variations, but the basic ingredient is soft wheat flour which is generally unbleached and enriched with B vitamins and iron. Shortening makes crackers tender and sets them apart from hardtack. It is used in cracker doughs and also sprayed on top to enhance appearance and mouthfeel. Animal fats (lard, beef fat) and vegetable oils (soybean, palm, cottonseed, coconut and others), which are generally partially hardened, are used alone and in combination.

Salt sharpens the flavor impact and gives crackers a major part of their characteristic taste. Other flavor ingredients include cheeses of all kinds, sugar, spices, herbs, and almost anything else which the baker can think of and the public enjoy.

Various additives are used to give desired characteristics to crackers. These ingredients include leavening agents (baking soda, yeast), dough conditioners, emulsifiers, preservatives to maintain freshness, flavors, and colors.

Nutritionally, What Do Crackers Do for You?

Because crackers are primarily enriched wheat flour, they supply B vitamins and iron, as well as energy (60-80 calories per 1/2 ounce serving), some protein, moderate amounts of fat, and generous amounts of carbohydrate, most of which is starch. Among the other minerals present are calcium, phosphorus, and sodium and small amounts of trace minerals such as magnesium, manganese, zinc, and copper.

Nutrient profiles for some of the popular cracker types look like this:

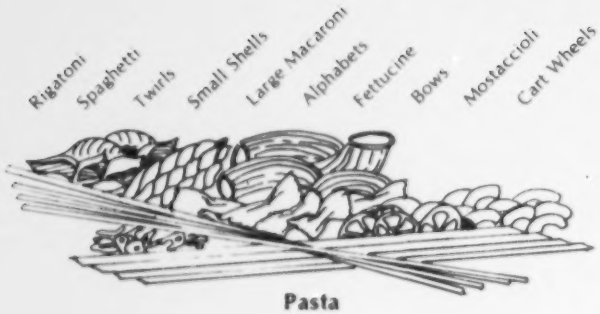
	Per Half Ounce Serving			
	Saltines	Round Buttery Crackers	Cheese Snack Crackers	Honey Graham Crackers
Number of Crackers	5	4	13	2
Calories	**60**	**80**	**70**	**60**
Protein (grams)	1	1	1	1
Carbohydrate (grams)	10	9	9	11
Fat (grams)	2	4	3	1
Sodium (milligrams)	190	140	150	90
	% of U.S. Recommended Daily Allowance			
Protein	2	*	2	*
Vitamin A	*	*	*	*
Vitamin C	*	*	*	*
Thiamin	6	4	6	2
Riboflavin	4	2	4	2
Niacin	4	2	4	2
Calcium	2	2	2	*
Iron	2	2	2	2
Phosphorus	2	2	2	

*Contains less than 2% of the U.S. Recommended Daily Allowance of these nutrients. Crackers normally do not contain any vitamin A or Vitamin C.

Snack Time

Americans have become a generation of snackers, and crackers certainly are one of the premiere snack foods. They are an important component of party food, complement other foods at mealtime, and serve as a quick snack at anytime. Pretzels are also one of our favorite wheat food snacks. Five small 3-ring pretzels have about the same amount of calories and nutrients as 5 saltines, but they are a little lower in fat and somewhat higher in sodium. Sodium varies with the type of pretzel we buy. The saltier, of course, the more sodium. So, if you're concerned with hypertension, look at the sodium content of *all* foods you eat, not just the snacks. And also consider trying the new lower salt snacks coming onto the market.

Snacking is not all bad provided the snacks fit into a total dietary pattern and do not just add calories on top of an otherwise adequate intake. The dietary key to avoiding a waistline which expands with age is moderation and control of total food consumption. In this way, we can derive the pleasure which eating brings, obtain the nutrients we need to operate every day, and still keep body weight under control.



Pasta

Of the many nutritious U.S. wheat foods, pasta is one of the most versatile.

- It's a food for all seasons.
- It's gourmet on a budget.
- It can play the starring or supporting role in any meal.
- It's a calorie-conscious satisfier of the heartiest or lightest appetite.
- It's low in fat and salt; high in complex carbohydrates.
- It's long and thin, wide and flat, curved and straight, solid and hollow, round, square and spiraled.
- It's good-for-you; it's eating pleasure.

Pasta's Past

Stories, legends, tall tales and true; the history of pasta is full of them. Actually, like all wheat foods, the origin of pasta goes back to the dawn of agriculture. Pasta was among the foods of the ancient Chinese, the Etruscans, the Greeks, the Romans. It was, of course, the Italians who elevated pasta to high art and named so many of its versions.

Like many other European delicacies, pasta was introduced into America by Thomas Jefferson. He became fascinated with it on a trip to Italy and had four cases of "maccarony" and a pasta-making machine shipped to Monticello.

Pasta's place in the American diet was secured by the Europeans who immigrated to this country in the last century. But until World War I, when supplies were cut off, pasta was principally an imported product. Today, most of our pasta is made from American durum or other hard wheat, some of the world's best.

Pasta Products—The Long and The Short Of It

Pasta comes in more than 150 shapes and sizes from bows to cartwheels to shells; from dainty spaghettini to massive manicotti. All are variations of three basic dry pasta products—macaroni, spaghetti and egg noodles. Above are a few examples of the wide variety available for culinary creativity.

Or you can find some pasta in convenient canned and frozen forms with the sauces already made.

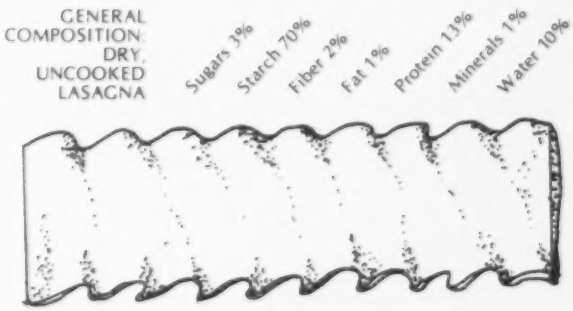
Pasta Making

Many pastas begin with the same simple recipe of semolina and water. Semolina is the golden-yellow, coarsely-ground flour made from hard durum wheat. Other pasta contain farina or wheat flour with the semolina. Noodles contain at least 5.5% egg solids. Some pastas contain other ingredients such as spinach or tomato for added flavor, color, and nutrients.

The dough mixture is formed into the different pasta shapes. Products like linguini, spaghetti and lasagna are extruded, forced through bar dies to produce long strands or strips. Bows and ravioli are stamped out like cookies with a cookie cutter. Shapes like shells, elbows, alphabets, and cartwheels are extruded from round dies. After the pasta is shaped, it is slowly dried to remove most of the water used for mixing.

Pasta Nutrition

For good health, people need carbohydrates, protein and fats in proper proportion in the diet. Pasta, like most wheat foods, is low in fat and a good source of complex carbohydrates plus protein, vitamins and minerals to boot. Here's the general make-up of typical pasta product:



Almost all American pasta products are made with flour enriched with three B vitamins and iron. The nutrition statement on the pasta package lists how much of the U.S. Recommended Daily Allowances of these and other nutrients each pasta serving provides. Here are some representative breakdowns for each of the three basic pasta types.

Examples of *Nutrition Information* for Enriched Dry (Uncooked) Pasta Products

	Macaroni & Spaghetti	Egg Noodles
Serving Size	2 ounces	2 ounces
Calories	210	220
Protein (grams)	7	8
Carbohydrates (grams)	42	40
Fat (grams)	1	3
Sodium (milligrams)	5	12
% of U.S. Recommended Daily Allowance		
Protein	10	10
Vitamin A	*	*
Vitamin C	*	*
Thiamin	35	35
Riboflavin	15	15
Niacin	15	15
Calcium	*	2
Iron	10	10

*Contains less than 2% of U.S. Recommended Daily Allowance of these nutrients

Even after cooking, which can result in some loss of water soluble B-vitamins, amounts still present make these products important sources of thiamin, riboflavin and niacin. Naturally occurring, but not listed on nutrition information panels are smaller quantities of other vitamins and minerals required for good health.

Pasta on a Diet

Pasta is perfect on a weight control or fitness diet. Hard to believe? It's true! Not only is pasta for the calorie conscious (210 calories/5 cooked ounces), its wheat flour starch (called complex carbohydrate) is slowly digested, so you feel satisfied longer. And at the same time, a little fiber helps create bulk and maintain regularity.

Pasta on a Budget

As a main dish or a delicious companion to other foods, pasta is kind to the budget. For just pennies a serving, pasta can go casual to the family picnic or formal to a candlelight dinner. Though the pasta package gives typical serving sizes, you control the amount you want to suit your diet and taste. Pasta is easy to reheat, so there's little waste.

Pasta Preparation

Pasta is quick and simple to prepare. There are only two rules for proper pasta cooking—use plenty of boiling water and don't overcook!

Start with at least a quart of water for every four ounces of dry pasta. Bring the water to a fast boil. If you wish, lightly salt the water, but it's optional. Add the pasta in small amount so the water keepings boiling. Don't cover, and stir frequently to permit even cooking.

After about five minutes, test a piece of the pasta for doneness. It should be tender but firm to the bite. This is "al dente," and it's the precise moment of pasta perfection. Follow the package label for any special instructions such as preparation times when the pasta will be further cooked in a recipe.

When the pasta is done "al dente," immediately drain it in a warm colander and serve. If you're serving the pasta with a sauce, go easy. Let the natural goodness of the pasta come through, don't cover it up.

Pasta Keeping

Because pasta is a dry product, it will keep almost indefinitely with just a little care. Pasta should be stored in a cool, dry place. Because of pasta's attractive shapes and colors, countertop storage in tightly sealed glass containers will not only keep the product dry and fresh, it's a decorative addition to any kitchen.

Breads

Bread, the world's symbolic food.

Hearth-warmed, heart-warming bread.

It brings to mind pleasant images of home and mouth-watering aromas, colors, textures and flavors. No matter what your heritage, it is certain that bread played a part in your family background.

Ever since the first primitive flour and water cakes baked on the fire stones of Swiss lake dwellers 8,000 years ago, bread has been a traditional staple of all civilizations and cultures. Yet, while nutritionists are urging increased consumption of complex carbohydrate foods such as bread, Americans actually have been reducing their intake of these products because of changes in their eating habits and just plain misunderstanding of dietary needs.

A Bounty of Breads

Because the skill and artistry of baking have such a long history and so many cultural influences, there are breads to suit every taste and preference.

The most popular bread sold in the United States is white pan bread. As its name implies, it is baked in pans, instead of on the hearth, for a softer crust. Variations on the theme are white specialty breads. These include coarse-textured, homestyle, richer premium and buttery split-top.

Crustier bread, such as French, Italian and Vienna, are called white hearth breads. They contain little shortening or sugar and are baked directly on the hearth for crispier crusts.

Though two-thirds of the bread sold in America is white bread, variety breads are gaining in popularity. Whole wheat and wheat breads are the most well-known variety breads. Whole wheat is made only from whole grain wheat flour. "Wheat" bread usually con-

tains a mixture of about 75 percent white and 25 percent whole wheat flours.

Although wheat flour is the principal ingredient, mixed grain breads contain other grain or vegetable flours such as rye, oat, potato, alfalfa, soy and barley.

Other variety breads include fruit and vegetable specialties such as raisin and onion breads.

Because of renewed interest in dietary fiber, bakers have responded with higher fiber breads.

English muffins and bagels are increasingly popular. They contain high protein flour and little shortening for a denser texture. English muffins are grilled-rather than baked and bagels are boiled, before final browning in the oven.

And let's not forget hamburger and hot dog buns, which are so popular for cookouts. Or refrigerated and frozen doughs, crusts, bread, rolls, croissants and waffles. Or canned brown bread. The variety seems endless.

A Look in the Loaf

The basic ingredients of bread are flour, water, yeast, salt, shortening and sweeteners. Each performs a specific task in the recipe.

Flour provides the principal dough components.

Water releases the gluten in the wheat flour protein, which makes the dough resilient.

Yeast leavens, or lightens, the bread by forming carbon dioxide gas bubbles as it ferments. This causes the dough to rise. Yeast also adds flavor.

Salt controls the action of the yeast and enhances flavor. Of course, there are salt-free breads, too.

Shortening makes the bread tender and helps keep it fresh.

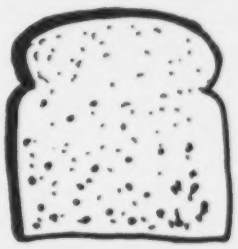
Sweeteners, such as sugar, honey and molasses, provide energy for the yeast, add flavor and combine with protein to form the brown crust.

In addition, certain other ingredients may be added to bread in small quantities to help condition the dough, add nutrients to improve keeping quality. You'll find them listed on the label, often with an explanation of their purpose.

The way ingredients are mixed, handled and baked also affects the product. For example, the density of two loaves made from the same ingredients can be changed by processing them differently. Or the use of different flours can alter appearance, flavor, texture and composition.

GENERAL COMPOSITION: WHOLE WHEAT BREAD

Sugars 2%
Fiber 5.5%
Starch 38%
Protein 10%
Minerals 2%
Fat 4.5%
Water 38%



GENERAL COMPOSITION: ENRICHED WHITE BREAD

Sugars 2%
Fiber 2%
Starch 45%
Protein 8%
Minerals 2%
Fat 4%
Water 37%

What's the Difference?

Not as much as we might have thought. Let's take a close look at the facts. As shown in the following table, whole wheat, wheat and white breads are quite similar in most respects. Whole wheat has somewhat more fiber and some vitamins and minerals than white or wheat breads. The reverse is true for some other nutrients. So variety is the best policy. Have some of different kinds. They're all good for us.

Nutrition Information Per One Ounce Slice

	Whole Wheat	Wheat	Enriched White
Calories	**70**	**72**	**76**
Protein (grams)	2.7	2.7	2.4
Carbohydrate (grams)	12.9	13.3	13.9
Fat (grams)	1.2	1.2	1.1
Fiber (grams)	1.5	0.8*	0.5
Sodium (milligrams)	181	153	146
% of U.S. Recommended Daily Allowance			
Protein	4.2	4.2	3.7
Vitamin A	Tr**	Tr	Tr
Vitamin C	Tr	Tr	Tr
Thiamin	6.7	8.7	8.7
Riboflavin	3.5	5.3	5.3
Niacin	5.4	6.4	5.3
Calcium	2.0	3.6	3.6
Iron	5.4	5.5	4.5
Vitamin B-6	2.5	1.5	0.5
Pantothenic Acid	2.1	1.2	1.2
Folacin	4.0	3.3	2.5
Phosphorus	7.4	5.2	3.1
Magnesium	6.5	3.3	1.5
Zinc	3.2	2.0	1.2
Copper	5.0	3.5	2.0

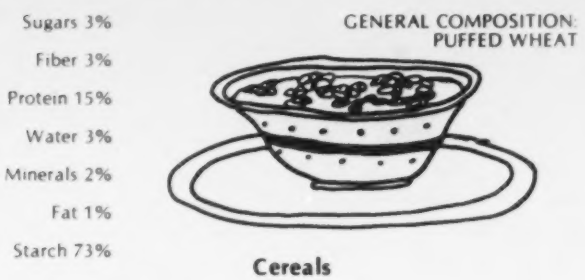
* Estimate at 25% whole wheat flour
** Tr = Trace amount.

Keeping It Fresh

Just a little care will keep your bread, bun and roll purchases fresh. When you've removed the number of servings you want, reseal the wrapper properly to keep out air and moisture. Keep the package at room temperature. If not for use within a few days, freeze the package in an airtight plastic bag.

Break Out the Bread

When you're hungry, especially if you're on a diet, satisfy yourself with a slice of bread. Not only is it economical nutrition, costing as little as two cents a slice for enriched white bread, but it stays with you. Just go easy on the spreads or toppings. That's where the extra calories can come from and add up.



Cereals

The word CEREAL is derived from the picturesque Roman ceremonies known as "the cerealia" celebrated in honor of Ceres, Goddess of Grain. These festivals, celebrated in mid-April, were instituted about 500 B.C. on the occasion of a wide-spread drought which threatened to induce a famine. The festivals were intended to solicit protection for the growing grain crops.

In the days of the Roman Empire, cereals were pounded in a mortar with a pestle, with the resulting meal mixed with water and cooked into a porridge calls *puls*. It was the national dish of the day. But it took until the 1890's for a similar product to be made commercially in the United States, a breakfast porridge called "Cream of Wheat".

Remarkably, during the same decade, in Battle Creek, Michigan, Dr. John Harvey Kellogg introduced "Toasted Wheat Flakes" as a health food while his former patient, now local competitor, Charles W. Post began to successfully market crumbled bits of baked wheat called "Grape Nuts". Niagara Falls chipped in with Henry D. Perky's "Shredded Wheat" and our modern breakfast cereal industry was off and running.

Today, everybody knows about the importance of breakfast. No matter what you hear about breakfast skippers, nearly 90% of all Americans have some kind of breakfast. They know it's the time to refuel, and wheat cereals make it a snap.

Whether its the crispy whole wheat goodness of a bowl of flakes laced with cold milk and fruit or the smoothness of hot farina, wheat cereals are tasty, convenient and low-cost nutrition.

In today's busier families, more children are making their own breakfasts. Wheat cereals are easy to prepare and are packed with food energy. Because most wheat cereals are fortified with vitamins and iron and eaten with milk, parents can be more confident that their kids are starting the day nutritionally right.

The Cereal Nutrition Scorecard—Your Choice

Here's how four popular types of wheat cereals stack up on a nutritional profile, the kind you'll find on the product packages.

	Shredded Wheat 1 biscuit	Flakes 1 oz.	Quick Farina 1 oz.	Sweetened Puffs 1 oz.
Calories (dry)	90	110	100	110
Calories (with ½ cup whole milk)	170	190	180	190
Calories (with ½ cup 2% milk)	155	175	165	175
Protein (grams)	2	3	3	2
Carbohydrate (grams)	19	23	22	26
Fat (grams)	1	1	-0-	1
Sodium (milligrams)	10 or less	370	130	—
% of U.S. Recommended Daily Allowance (Cereal Without Milk)				
Protein	4	4	4	2
Vitamin A	*	25	*	25
Vitamin C	*	25	*	*
Thiamin	4	25	10	25
Riboflavin	*	25	4	25
Niacin	6	25	6	25
Calcium	*	4	4	*
Iron	4	25	45	10
Vitamin D	—	10	—	10
Vitamin B6	—	25	—	25
Vitamin B12	—	25	—	25
Phosphorus	8	8	8	4
Magnesium	2	8	—	—
Zinc	2	4	—	—
Copper	4	6	—	—

*Contains less than 2% of the U.S. Recommended Daily Allowance of these nutrients.

A serving of each of these four cereals has about 100 calories, is low in fat and high in carbohydrates. Fiber content ranges from about 2.5 grams per serving of shredded wheat to only a little in farina. There is a wide range of fiber levels to be found on package labels. Cereals made almost entirely from bran contain 8-9 grams of fiber per ounce, 40% bran flakes, about 4 grams per ounce and plain wheat flakes, from 0.5 to 2 grams per ounce.

A Word about Fortification

Most ready-to-eat cereals have at least seven vitamins and iron added at the 25% of U.S. Recommended Daily Allowance level per serving. Other minerals may be added at lower levels. A few, however, have as much as 100% of the U.S. Recommended Daily Allowance per serving.

Just like enrichment of flour, fortification of cereals was begun more than 40 years ago to get needed nutrients into the diets of many in order to improve general health. Fortification is the reason wheat flakes, puffs and farina on our nutrition profile have significantly more of certain nutrients. The nutrients added to cereals complement the nutrients in milk.

What about Sugar?

We consumers are often more concerned about sugar content in foods than their over-all nutritional value or the content of any other ingredient or substance. That's why there's been some controversy about presweetened cereals. However, studies show that most children actually get less sugar from a serving of presweetened cereal than they sprinkle on unsweetened products.

The controversy centers on the percentage of sugar in the products. But percentages can be misleading. The amount of sugar per serving is a better measure. As an example, a one-ounce serving of presweetened cereal has less sugar than a medium-sized apple or a six-ounce glass of canned orange juice.

Load Up on Variety for Pennies

No matter what your preference, wheat cereals offer a huge variety. Take your pick from...

Shredded,	unsweetened
puffed,	ready-to-eat,
flaked,	cooked regular,
fruited,	cooked instant,
flavored,	high or low fiber.
sweetened,	and more....

And best of all, this good tasting nutrition costs less than 20 cents a serving, including the milk!

Look for Details

Many breakfast cereal packages have an information panel about carbohydrates (simple, complex, fiber). These specifics can help you choose the product which best suits your needs if you're watching fiber and calories carefully.

Keeping's a Snap in the Factory Wrap

Because cereal is a dry product (the water used for mixing the dough is removed), it doesn't require any special storage. Packages are designed to be easy to reseal and keep moisture out.

Desserts

"Would ye eat your and have your cake....?"

"What calls back the past, like the rich pumpkin pie....?"

"The optimist sees the doughnut, but the pessimist sees the hole...."

"Pat-a-cake, pat-a-cake, baker's man...."

From nursery rhymes to poetry to philosophy to the Old Testament, wheat sweets have figured in our literature from childhood on. And they have been found in human history since the ancients first baked crude cakes.

Egyptians produced flavored, colored and shaped cookies that bear a striking resemblance to modern products. With the emergence of true pastry cooks in the fourth century, pastry baking became art. Over the centuries, those with the talent to produce mouth-watering baked sweets received acclaim, status and even wealth. Today, to be a "patissier" or pastry chef is one of the most highly regarded disciplines in the art of French cuisine.

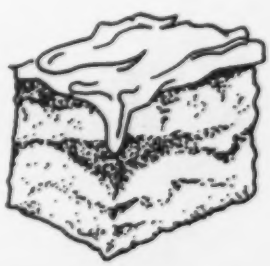
Yet, the noble pastry has become a target of criticism for the very things that have made it desirable, its sugar and fat. With questions about sugar in foods high on the list of consumer concerns, consumption of sweetened foods has declined. But sweet products, eaten in moderation, have a positive role in the diet, not just for the calories and nutrients they carry, but because they give us pleasure.

Checking the Dessert Nutrition Scorecard

Of all wheat food products, cakes, pies, pastries and cookies have the most sugar and fat. That's part of what makes them what they are—enjoyable. But they also contain some protein, fiber, starch, vitamins and minerals. Here's the general percent composition of a piece of marble cake for example.

GENERAL COMPOSITION: MARBLE CAKE

Water 27%
Minerals 2%
Fat 15%
Protein 4%
Fiber 1%
Starch 19%
Sugars 30%



The perception is that these tasty foods are high in calories. But how high is high? Consumers surveyed thought that a cream filled snack cake contains 419 calories! The actual calorie count is 160.

Critics have called sugar calories "empty" and products that contain sugar "junk food." To be sure, overconsumption of sugar and especially in sticky foods, along with poor dental hygiene, can lead to tooth decay, but if we all practice sensible eating and good dental care habits, we need not fear an occasional sweet. Besides, a "Danish" or a doughnut or a snack cake or a couple of cookies may quell the hungries while adding to our total dietary intake of complex carbohydrates and other nutrients important to good health.

Here's how three favorite sweet snacks stack up on specific nutrients *per ounce*.

	1 Small Danish	2.5 Chocolate Chip Cookies	1 Cake Donut
Calories	**114**	**140**	**123**
Protein (grams)	2	2	1
Carbohydrate (grams)	13	19	14
Fat (grams)	6	6	7
Sodium (milligrams)	109	58	158
% of U.S. Recommended Daily Allowance			
Protein	2	2	2
Vitamin A	*	*	*
Vitamin C	*	*	*
Thiamin	4	4	4
Riboflavin	4	4	4
Niacin	2	4	2
Calcium	2	*	*
Iron	2	2	2

*Contains less than 2% of the U.S. Recommended Daily Allowance of these nutrients.

Selecting Sweet Products

What you buy depends only on your imagination and your flavor preferences. There's hardly a fruit, nut, dairy filling or topping that hasn't been tried on a Danish, doughnut, pie, cake or cookie.

Size and form you purchase depends on your need for convenience. Individual fruit pies and snack cakes are great to add to lunch at home or on the go. Of course, there are rich and fancy versions designed for special occasions than can compare with the best homemade.

As for cookies, here's a list of some favorites.

Ginger Snaps	Lemon Crisps
Wafers	Sandwiches
Raisin	Oatmeal
Chocolate Chips	Fig Bars
Shortbread	Coconut Bars
Sandies	Peanut Butter

So Count and Enjoy

One of the rewards of eating, healthy, balanced meals is that you *can* include desserts and treats once in a while. If the product you choose contains several servings, be sure to replace the original wrap and cover the remaining portion with foil or plastic wrap to seal in freshness.

Nebraska Cooperative Extension Service 4-H 218

MATH PRACTICAL APPLICATION

UNIT 5

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

PURPOSE

To help students learn more about the practical math applications used in the day to day activities of agriculture and agri-business.

SUMMARY OF LEARNING ACTIVITIES

The following sections have been developed using agricultural-related problems. The sixth grade math text Addison-Wesley Mathematics has been used as the format for the five sections in this unit. Teachers are asked to choose those sections that are appropriate for their students.

OBJECTIVES

1. The students will gain an appreciation for math skills that are used within an industry in everyday transactions.
2. Sections are organized so that a series of questions will coordinate with math levels achieved by students during the course of the year.

LEARNING ACTIVITIES

This unit is divided into five sections:

Activity
1. Addition and Subtraction
2. Addition and Subtraction with Decimals
3. Multiplication
4. Division
5. Measurements

ADDITION AND SUBTRACTION

Farmers measure wheat in bushels. This is the unit of measure that the farmer, the grain elevator operator, and banker refer to when talking about yield, production, and sales.

1. A farmer at Waverly has three bins of wheat. The first bin holds 7,246 bushels, the second 8,907 bushels, and the third 3,549 bushels. How many bushels do the three bins hold?

2. A large wheat field in Lancaster County produced 4,642 bushels of wheat. A field of the same size in Lincoln County produced 3,477 bushels. How many more bushels were produced in the first field?

3. Ms. Reed, the local banker, needs to keep a record of how many bushels of grain each of her farm borrowers has stored on the farm. Mr. Thomas has two grain bins on his farm. The first bin holds 5,360 bushels and the second holds 4,240 bushels. If Mr. Thomas sells 1,335 bushels how many bushels will Ms. Reed show on the bank records for wheat on hand?

4. The local grain elevator has three large bins that contain 425,000, 382,500, and 438,475 bushels respectively. The elevator loads a 75-car unit train that holds a total of 125,316 bushels. How many bushels are now at the grain elevator?

5. If the farmer in problem 3 sold an additional 1,200 bushels how many bushels would he now have stored on his farm?

6. A farmer has 7 fields of wheat. She needs to total the number of acres so that she knows how much wheat seed to order for planting in the fall. The fields are 23, 19, 82, 45, 28, 15, and 17 acres in size. How many bushels will she need to order if she plants one bushel per acre?

7. The fertilizer dealer delivers three loads of fertilizer to the Jenkins Farm. The loads weigh 10,260 lbs., 9,880 lbs., and 8,940 lbs. How many pounds of fertilizer will the Jenkins Farm be billed for?

8. A farmer has purchased 5 loads of fuel to operate the engine of his irrigation well. The five loads cost $149, $289, $449, $267, and $512. What is his total fuel cost for operating the irrigation well?

DECIMALS: ADDITION AND SUBTRACTION

Most work that farmers do with adding decimals involve money and calculating the differences between sizes of fields, yields, and the production of farm animals.

1. Mr. Thomas hired his neighbor to harvest a field of hay for him because he does not have the equipment to do the job himself. When Mr. Jefferson completed the harvest he billed Mr. Thomas for the costs, $63.50 for windrowing, $109.25 for baling, and $7.65 for twine to wrap the bales. What is the total amount owed Mr. Jefferson?

2. Mr. Jefferson's windrower can cut 60 acres a day. He has three fields that he needs to cut today. The size of those fields is 36.14 acres, 11.48 acres, 9.07 acres. What is the total number of acres to cut today? Will he be able to finish these three fields in one day?

3. Ms. Johnson manages the swine production unit on Mr. Thomas' farm. She is interested in finding out how much better the production is in Barn A as compared to Barn B. Barn A weans an average litter size of 9.13 pigs per litter and the average pig weight is 17.4 pounds. Barn B has an average litter size of 8.79 pigs per litter and the pigs weigh an average of 15.9 pounds. How many more pigs per litter does Barn A average over Barn B? What is the difference in weights of the average pig between the barns?

4. Ms. Johnson hired three students to clean one of the hog barns between groups of pigs. They each worked for different amounts of time. Tim was paid $21.34, Brian $15.83, and Nancy received $20.50. What are the labor costs for cleaning the hog barn?

5. Mr. Thomas sold two loads of hogs at the local hog buying station. He received $5,290.75 for the first load and $3,987.35 for the second. There is a commission fee charged by the station for handling the hogs which comes to $152.25. What is the net amount that Mr. Thomas will be paid for the hogs?

6. Mr. Jefferson is going to sell three large round bales of hay to Mrs. Washington for her horses. Hay is usually sold by the ton, so they had the bales weighed to calculate the selling price. The first bale weighed .897 tons, the second .789, and the third .906 tons. What is the total tonnage that Mrs. Washington is buying?

7. Mr. Jefferson sold 3 loads of wheat to the local elevator. The loads each contained 675.33 bushels, 668.67 bushels and 659.00 bushels. What is the total number of bushels that were taken to the elevator? If the wheat is worth $3.34 per bushel then the loads are each worth, $2,255.60, $2,233.36, and $2,201.06 respectively. What is the total value of the wheat sold to the elevator?

MULTIPLICATION

Agriculture in Nebraska requires the use of multiplication to find answers to problems such as how many of a certain item are needed, what is the estimated production of a crop, or how many people can be served by the production of this state.

1. A cow will eat 22 lbs. of hay a day during the winter when there is no pasture or range available to eat. If there are 2,050,000 cows in the state how many pounds of hay could they eat in one day? If winter snow keeps the cows in the farmlots for 90 days how much hay will be eaten?

2. In 1983 Nebraska farmers raised 3,350,000 acres of irrigated corn. If the average yield is 124 bushels per acre, how many bushels of corn were produced on irrigated farm ground? The same year corn was also produced on non-irrigated ground totalling 1,600,000 acres. The average yield produced was 58 bushels per acre. How many bushels of dryland corn were produced?

3. If a dairy farmer can milk 43 cows per hour in a modern milking parlor, how many cows can he milk in 2 hours? If the average cow produces 45 pounds of milk a day how much milk is produced from 100 cows in one week?

4. A bushel of corn weighs 56 pounds. If an acre of corn produces 124 bushels, how many pounds would this equal? A corn refiner can extract 33 pounds of fructose corn sweetener from a bushel. Therefore, how many pounds of sweetener can be produced from this acre of corn?

5. A pork producer loads 186 hogs onto a truck. If each of these hogs weighs 220 lbs. how many pounds have been placed on the truck? What would the weight be if the hogs had weighed 232 lbs?

DIVISION

Division allows people in agribusiness to calculate their costs per unit for the product they are selling. Complete the following questions. Round your answers to the nearest cent or two digits to the right of the decimal point.

1. The Clarkson Elevator just purchased 610 bushels of wheat from Mr. Calhoun. They wrote a check for $1,891.00. What is the price of one bushel of wheat at the elevator?

2. Thanks to the honey bee, Nebraska is able to produce alfalfa seed from plants pollinated by the bees. If 2,475 lbs. of seed are produced from one field and the seed is valued at $1,980.00 what is one pound of seed worth?

3. A farmer has two fields which are both 25 acres in size. The first field produced 2,400 bushels and the second field produced 2,525 bushels. What is the yield (bushels per acre) in each of these fields?

4. Use the answers in the previous question to help solve this problem. Each field cost $6,125 to produce. What is the farmer's cost per bushel in each of the two fields? (Hint - cost divided by bushels.)

5. Mr. Lincoln has a flock of 260 ewes (adult female sheep) on his farm. This year they produced 364 lambs. How many lambs were produced by the average ewe? The ewes also produced 2,080 lbs. of wool at shearing time. How many pounds did the average ewe shear?

6. Mr. Hill has 50,000 laying hens in his egg production facility. If 1,000,000 dozen eggs are produced each year in this facility how many eggs are produced by each chicken? Remember that there are 12 eggs in a dozen.

7. The local fertilizer plant purchased 1,500 tons of fertilizer at a total cost of $393,600. What is the price per ton of fertilizer?

BONUS QUESTION

Ms. Valley purchased 30 tons (one ton equals 2,000 pounds) of fertilizer to place on her corn crop. If she has 300 acres and the fertilizer cost a total of $7,872, how much did the fertilizer cost per pound and how much did she place on each acre?

MEASUREMENT

Most measurements in agriculture have not yet converted to the metric system. In this exercise students should work the first half of each problem with the traditional system and the second half with the metric system. If students use a calculator on this section carry out all decimal places.

1. The area of Mr. Coolidge's rectangular milo field can be calculated by multiplying the length times the width. He needs to know the area so that he can purchase seed to plant this coming spring. The field is 2,000 feet long by 450 wide. He wants to plant 6 lbs. of seed per acre. (Hint - an acre is equal to 43,560 square feet.) How much seed should Mr. Coolidge purchase?

Now do the same problem with a field size of 610 meters long and 140 meters wide. The amount of seed needed is 6 kg per hectare (a hectare is equal to 10,000 square meters).

2. A unit train of wheat is loaded in McCook. Each one of the 72 cars on the train holds 100 tons (one ton equals 2,000 lbs.). If the price loaded on the train is worth $116.67 per ton, what is the value of the unit train of wheat?

Now do the same problem with a unit train of 72 cars where each car holds 91 metric tons of wheat. If a ton is worth $128.34, what is the value of the train load of wheat?

3. If a square mile contains 640 acres (One mile equal 5,280 feet), how many acres are in a rectangular field measuring one-half mile by one-half mile? (Remember that, if you need it, one acre equals 43,560 square feet.)

Now calculate the number of hectares in an area of .50 kilometers by .50 kilometers. (Remember that there are 1,000 meters in a kilometer and that there are 10,000 square meters in a hectare.)

4. The fuel tank on a large tractor holds 80 gallons of fuel. If the fuel weighs 2 lbs. per quart and there are 4 quarts per gallon, how many pounds of fuel does the fuel tank hold?

The fuel tank of the metric tractor holds 300 kilograms of fuel. If the fuel weighs .95 kilograms per liter, how many liters does the tank hold?

5. There are 38 steers that were sold at the stockyards. Their total weight was 45,600 lbs. If the steers are worth $60.00 per hundredweight, (A hundredweight equals 100 lbs.), what is each steer worth? What is the total value of the 38 steers?

If the same 38 steers are weighed on a metric scale, what is their weight in kilograms if 2.2 pounds equal 1 kilograms? If the price is now changed to $1.32 kilogram, what is the new value of the 38 steers?

Activity 5.1

1. 19,702 bushels
2. 1,165 bushels
3. 8,265 bushels
4. 1,120,659 bushels
5. 7,065 bushels
6. 229 bushels
7. 29,080 lbs.
8. $1666

Activity 5.2

1. $180.40
2. 56.69 acres
   Yes
3. .34 Pigs
   1.5 pounds
4. $57.67
5. (5290.75 + 3987.35) - 152.25 = $9125.85
6. 2.592 tons
7. 2003.00 bushels
   $6690.02

Activity 5.3

1. 45,100,000 pounds
   4,059,000,000 pounds
2. 415,400,000 bushels
   92,800,000 bushels
3. 86 cows
   (45 x 100)7 = 31,500 lbs.
4. 6944 lbs.
   4092 lbs.
5. 40920 lbs.
   43152 lbs.

Activity 5.4

1. $3.10 per bushel
2. $0.80 per pound
3. 96 bushels per acre
   101 bushels per acre
4. $2.55 per bushel
   $2.43 per bushel
5. 1.4 lambs per ewe
   8.0 pounds wool per ewe
6. 240 eggs per chicken per year
7. $262.40 per ton

BONUS
$.1312 per pound or $.13 per pound
200 lbs. per acre

Activity 5.5

1. 123.97 lbs.
   51.24 kg
2. $840,024.00 per train load
   $840.883.68 per train load
3. 160 acres
   25 hectares
4. 640 lbs.
   315.79 liters
5. $ 720.00 per steer
   $27,360.00 for 38 steers

   (45,600 divided by 2.2) x 1.32 = $27,363.00

Nebraska Cooperative Extension Service 4-H 219

WHEAT TRIVIA GAME

UNIT 6

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

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PURPOSE

The Wheat Trivia Game is designed to reinforce learning which students have experienced in all units.

SUMMARY OF LEARNING ACTIVITIES

Wheat Trivia Game including rules, questions and answers.

OBJECTIVES

Students will recognize what they know or don't know about the Wheat Science project.

Students will verbalize answers in a competitive situation.

Students will have an incentive to review Wheat Science learning experiences.

VOCABULARY

Refer to glossary of terms.

SUPPLIES PROVIDED

Quiz bowl device (available from the Extension Office in some counties).

Wheat Trivia rules, questions and answers.

SUPPLIES NEEDED

If quiz bowl device is not available from Extension Service, bells, hands in the air, or other signalling device may be used.

Clock or watch to time response time.

Score board or pad or paper.

RESOURCES NEEDED BY THE TEACHER

Questions are based on materials provided in the 4-H Wheat Science School Enrichment Teacher's Notebook.

SOURCE OF QUESTIONS

Inside Wheat Foods
Food, Nutrition and Dieting
Willie Wonderful Wheat
Nature's Best
The Reliable American Farmer - Sperry-New Holland

RULES

Approach this activity as the fun occasion it is. Keep the atmosphere light and non-threatening to members.

Form Teams - You may be familiar with the television game show "GE College Bowl" which was aired in the 1960's. This activity is similar. Divide the group into two teams. A maximum of four members should serve on a team at a time. Two teams compete against each other at one time, thus involving a maximum of eight students.

Appoint an official timer, scorekeeper, moderator, and official judge (the teacher may wish to serve as judge).

The team members sit side by side behind the table, with the moderator positioned between the two teams. The moderator is responsible for asking questions. If the contestant would like to answer, the sound device should be activated. Upon being recognized by the official judge, the contestant should begin answering the question within five seconds. If the contestant fails to answer in the allotted period of time, or incorrectly answers the questions, one point is forfeited. The moderator then gives the correct answer to the question. It is the responsibility of the official judge to determine if the answer is correct, incorrect, or if more specific information is needed to constitute a correct answer.

The number of questions per game, or amount of time per game should be determined by the teacher prior to the start.

Scoring is as follows:

One point is awarded for each correct answer.

One point is deducted for an incorrect answer.

The official judge may disqualify a question if the need arises.

The team reaching the designated number of points first, or the team with the highest point total in the determined length of time will be declared the winner.

WHEAT SCIENCE TRIVIA QUESTIONS

1. **Name three of the five major classes of wheat?**

   Hard red winter, hard red spring, soft red winter, white, and durum.

2. **During what season is winter wheat planted?**

   Fall

3. **What is the major use of hard wheats?**

   Breads and pastas

4. **Name three products made from soft wheat?**

   Cookies, cakes, pastries, muffins

5. **All purpose flour is made up of what two types of wheat?**

   Hard and soft wheat are blended together

6. **What is the purpose of a mill?**

   A mill separates (breaks apart) the grain components

7. **Name the three major parts of wheat.**

   Bran, germ, endosperm

8. **What is the purpose of enriching bread?**

   Enriched bread adds essential nutrients (B vitamins and iron)

9. **Name the two major ingredients in most wheat food products?**

   Flour (wheat) and liquid (moisture) are necessary to turn flour into batter.

10. **When reading the label, which ingredient is listed first?**

    The ingredient used in the largest quantity by weight

11. **What is sodium bicarbonate?**

    Baking Soda

12. **Name two of the three major B vitamins?**

    Niacin, riboflavin, thiamin

13. **Starch and dietary fibers are examples of what type of carbohydrates?**

    Complex carbohydrates

14. **What types of carbohydrates are sugars?**

    Simple carbohydrates (glucose, fructose or sucrose)

15. **What is the principle dough ingredient in bread?**

    Flour

16. **What ingredient develops the gluten in flour?**

    Water (liquid)

17. **Which ingredient lightens the bread by forming carbon dioxide gas bubbles as it ferments?**

    Yeast

18. **Which ingredient slows the yeast action and enhances the flavor?**

    Salt

19. **What is the purpose of shortening in bread?**

    Tenderness and freshness

20. **What ingredients in bread add flavor and combine with protein to form a brown crust?**

    Sugar, honey, molasses

21. **What nationality elevated pasta to high art and named so many of the versions?**

    Italians

22. **Which inventive president introduced pasta to America?**

    Thomas Jefferson

23. **Name two of the three major variations of pasta?**

    Macaroni, spaghetti, noodles

24. **Name one thing to remember when cooking pasta?**

    Use boiling water and do not overcook

25. **How should pasta be stored?**

    Pasta should be stored in a cool dry place.

26. **How many calories does a single saltine cracker contain? Choose between 12, 24 or 36.**

    12 calories

27. **Name two ingredients which can be added to crackers to enhance the flavor?**

Salt, sugar, herbs, spices, cheese

28. **Which contains a higher sodium content — pretzels or crackers.**

Pretzels

29. **What percent of Americans eat something for breakfast? Choose from 20%, 60% or 90%**

90%

30. **An average serving of cereal, including milk, costs approximately 10 cents, 20 cents or 40 cents?**

20 cents

31. **Name one thing wise consumers do before shopping?**

Read grocery ads, make a list, organize coupons

32. **What is a major ingredient added to noodles, which is not in macaroni and spaghetti?**

Eggs

33. **Name at least two ways to prepare macaroni?**

Casseroles, Macaroni and Cheese, Salads

34. **Name two factors consumers consider before purchasing a food product?**

Freshness, care of teeth, weight control, sugar and salt consumption, balanced diet

35. **Name two reasons people are on special diets?**

Weight control, medical reasons

36. **What age group (young, middle age, old) are most likely to be on special diets?**

Older citizens (55 and over)

37. **What do the initials USDA stand for?**

United States Department of Agriculture

38. **What is drought?**

Lack of moisture in the soil

39. **Who develops new varieties of wheat?**

Seed breeders, university scientists

40. **How many years does it take to develop a new variety of wheat?**

15 - 30 years

41. **Name two factors which determine the amount of wheat harvested?**

Weather, soil fertility, variety of wheat, insects and disease

42. **Are the majority of wheat farms family owned or corporate owned?**

Family owned

43. **Is wheat a member of the grass or legume family?**

Grass

44. **Why do farmers work long hours during wheat harvest?**

Adverse weather and over-ripe wheat reduce yields.

45. **What are two things farmers can do with wheat after it is harvested?**

Sell and deliver wheat to elevator at market prices or store the wheat on the farm and hope to sell it later at a market price.

46. **What is the reason that government sometimes asks farmers to cut back wheat production?**

A wheat surplus exists.

47. **What method of transportation is used to deliver wheat from the U.S. to China?**

Ship (boat)

48. **What means of transportation is used to transport wheat from Omaha to the Gulf of Mexico?**

Barge

49. **Of all the wheat produced in the U.S., do we export the majority or do we use it here (domestic)?**

It is used domestically

50. **Yes or No. Farmers in the U.S. can't produce enough wheat to feed the nation.**

No. The U.S. farmers produce more than enough to feed the nation. The excess is called a surplus.

51. **Name two of the wheat farmer's production costs.**

Land payment, seed, fertilizer, insecticide, equipment, labor costs.

52. **Which is highest in protein, hard wheat or soft wheat?**

Hard wheat

53. **What is the primary type of wheat grown in Nebraska?**

Hard red winter

54. **Is the metric ton or the short ton (U.S.) used in reporting international trade?**

Metric ton

55. **How many pounds are in a metric ton?**

Approximately 2,200 (2,204.6) lbs.

56. **How often is wheat planted?**

Once a year. It is an annual grass.

57. **What color is wheat before it ripens?**

Green

58. **What is the top of the wheat plant called?**

Head (spike)

59. **What part of the wheat is inside the head?**

Kernel - grains (bran, germ, endosperm)

60. **Approximately how many kernels of wheat are contained in a pound? 600, 6,000 or 16,000**

16,000 kernels of wheat in a pound

61. **What part of the kernel provides fiber in your diet which is essential to the body's elimination process?**

Bran

62. **Which part of the kernel is the sprouting section of the seed?**

Germ

63. **Why is the germ usually separated from the kernel before making flour?**

The germ contains fat which limits the storing time (shelf life) of flour.

64. **What does the "shelf life" of food mean?**

Shelf life is the length of time the product can be kept on the shelf without loss of quality.

65. **Of bran, germ and endosperm, which is 2 1/2% of the kernel?**

Germ

66. **What part of the kernel is the source of white flour?**

Endosperm

67. **What parts of the kernel are removed when white flour is milled?**

Bran and germ

68. **What does the elevator manager do when a farmer brings a load of grain with too much moisture content?**

Manager doesn't accept the wheat.
The price paid to the farmer is reduced.
It may be necessary to artificially dry the grain.

69. **What do the initials RDA stand for?**

Recommended Daily Allowance

70. **According to the recommended daily allowance, how many servings from the bread and cereal group should be eaten daily?**

Four

71. **What is the wheat berry?**

Wheat kernel

72. **What part of the kernel weighs the most?**

Endosperm

73. **What part of the wheat kernel contains fat?**

Germ

74. **How many calories per gram are found in carbohydrates, 4, 9 or 20?**

4

75. **Yes or No. Pasta is low in sodium.**

Yes

76. **Which type of bread contains more fiber - whole wheat or white?**

Whole wheat

77. **What is the name of the outer layer of the wheat kernel?**

Bran

78. **What kind of flour is in white bread?**

White or all-purpose

79. **Wheat bread is made from what two flours?**

Whole wheat and white

80. **Why should bread not be stored in the refrigerator?**

The refrigerator tends to stale bread quickly.

81. **Name 3 of 11 flours made from wheat?**

All-purpose, bread, self-rising, cake, pastry, gluten, semolina, farina, whole wheat, white, graham

82. **Baked products tend to be heavier and denser when which type of flour is used?**

Whole wheat

83. **True or false. To measure flour correctly, one should shake the cup or hit it with a spoon.**

False. Spoon flour into measuring cup until the flour overflows. Level the cup with the straight edge of a spatula or knife.

84. **What is the most common ingredient found in quick breads that makes them rise?**

Baking powder

85. **Biscuits are an example of a quick bread. Name two more.**

Muffins, pancakes, crumpets, waffles, popovers, spoon bread

86. **High quality pasta products are made from which type of wheat?**

Durum

87. **True or false. Four ounces of uncooked macaroni will equal one-half cup of cooked macaroni.**

False. Four ounces uncooked macaroni will equal 2 1/4 cups cooked macaroni.

88. **How much does a bushel of wheat weigh?**

60 lbs.

89. **A bushel of wheat yields approximately how many pounds of flour? 42, 75 or 110 lbs.**

42 pounds

90. **How many one pound loaves of bread are made from a bushel of wheat? 50, 70, or 90 loaves?**

70 loaves

91. **The wheat in a loaf of bread brings the farmer, 5, 10 or 15 cents?**

5 cents

92. **Which is larger, an acre or a square block?**

A square block = 3.25 to 4.4 acre

93. **What is grain transported in from the field to the grain elevator?**

Truck or wagon

94. **What is the name of the machine that cuts, threshes and separates the grain from the straw?**

Combine

95. **What is the name of the machine which plants the wheat seed?**

Drill

96. **What is the building called which holds several million bushels of grain from many different farms?**

Grain elevator

97. **What term is used to describe farmers putting their grain together to sell as a group?**

Cooperative

98. **Agriculture provides many jobs in industry by supplying raw materials. Each farmer helps create jobs for how many people? 2, 9 or 25?**

Nine jobs are created by each farmer.

99. **In what country were the first public bakeries established?**

Greece

100. **In what country was the first bread made?**

China or Egypt

BREADMAKING

UNIT 7

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

PURPOSE

To help students understand the scientific principles of breadmaking by individually experiencing the breadmaking process.

SUMMARY OF LEARNING ACTIVITIES

The students will work in groups of three to make bread dough in a bag. After the basic breadmaking process is complete, each group divides the dough into thirds, kneads their portion and bakes their individual loaf which may be taken home.

OBJECTIVES

1. To allow students the opportunity to have a hands-on experience making bread.
2. To acquaint students with the parts of the kernel -the bran, endosperm, and germ.
3. To allow students to see the yeast reaction producing carbon dioxide gas.
4. To describe what gluten is and how it is developed in breadmaking.

VOCABULARY

Knead
Yeast
Resting
Bran
Endosperm
Germ
Gluten
Carbon dioxide

LIST OF ADVANCE PREPARATION AND SUPPLIES NEEDED

1. Contact room mothers or other adult volunteers to assist students in measuring and mixing bread ingredients.
2. School cafeteria managers should be contacted to schedule use of the kitchen for baking. Have them preheat ovens to 400 degrees F.
3. School desks should be scrubbed or covered with paper for easy cleanup. If paper is used as cover, secure it to desk with tape.
4. Fill large bowl or pitcher with warm water (110-115 degrees F). Needed amount will be measured out by classroom adult volunteers.
5. Assign students to groups of three.
6. Have students wash hands thoroughly.
7. Have students write their names on the bottom of their foil pans. (Initials must be etched in the foil pan.)

LIST OF SUPPLIES PROVIDED BY LOCAL EXTENSION STAFF IN CLASSROOM KIT*

1. Refer to Wheat Bread recipe found in classroom kits (one per student)
2. Breadmaking Kits - one kit per three students in classroom.
   Contents of breadmaking kit:

large mixing bag	sugar
whole wheat flour	salt
white flour	bread pans
yeast	

3. Vegetable oil in small container to be measured during breadmaking process.
4. Measuring spoons and cups.
5. Samples of bran, endosperm, and germ.
6. Kernel of wheat poster.

* Supplies provided may vary from county to county, check cover letter.

RESOURCES NEEDED BY TEACHER

1. Water pitcher (approximately 2 quart size)
2. Paper towels

ACTIVITY - STEP BY STEP INSTRUCTIONS

1. Pass out bread kit, one per three students. Students will take ingredients out and put them on table or desk.
2. Students will put approximately one-half of the all-purpose white flour in the large bag. To this, add the yeast and the sugar. Have adults measure 1/2 c. of warm water in each large bag.
3. Students will close bag forcing air out. Hold top of bag with one hand while mixing ingredients with the other hand (caution students that bags can break if mistreated). Mix until completely blended. Close top of bag. Let rest 15 minutes.
4. While dough is resting, explain that the yeast will react to the dough. Carbon dioxide gas is formed which causes the dough to increase in size or volume. This gas is what causes the bread to rise by forming tiny holes in the bread.

   Explain that the protein in flour is called gluten. Gluten absorbs water and when mixed and kneaded, becomes tough and rubber-like. Pass around mill product samples of bran, endosperm, and germ for students to examine and if time permits, review the parts of a wheat kernel on the poster in the teacher kit.
5. Student now adds to dough, 3/4 cup warm water, all of the whole wheat flour, oil, salt and one-half of the remaining all-purpose flour. Oil will need to be measured out for each group of students - one tablespoon per bread kit.
6. Students mix in plastic bag until thoroughly mixed and dough pulls away from bag—five minutes. More all-purpose flour may be added as needed.
7. Students will flour their hands and a small section of their desks. Turn plastic bag inside out and remove dough.
8. Students should divide dough into thirds to knead.
9. Students knead dough (push, fold, push, fold, turn) for five minutes. Not all of the flour should be necessary, but use enough to keep dough from sticking to hands and desk.
10. Put kneaded dough in plastic bag and let rest ten minutes.
11. While dough is resting, students may oil their pans (bottom and sides) and clean up their area. Save smaller plastic bags to take bread home in.
12. After ten minutes, have students shape dough to fit pans. Put dough in the pans and turn dough over once to oil the top.
13. Cover pans with plastic bags and let rise 30-45 minutes or until dough is double in size.
14. Clean up and pass out Wheat Facts post card with wheat seed sample. The wheat seeds may be planted at home in the bread pan after the bread is removed.
15. Bake 30-35 minutes at 400 degrees F in school oven.
16. Turn bread out of pans on cooling racks for 15-20 minutes. If bread is not taken out of pans, the bread will get very soggy.

NOTE TO TEACHER

If your school does not have baking facilities, have students make dough in the afternoon. Time the project so that the dough is 2/3 risen at school's end. Students can then put pans of dough inside plastic sacks to take home. By the time students get home, dough is ready to be baked.

Don't be alarmed by the amount of flour left over. Extra flour was placed in each kit. In most cases, you will not want to use it all, but use enough to keep dough from sticking to hands and desk.

OPTIONAL ACTIVITIES

1. While bread is baking, make butter. Pour heavy whipping cream into small baby food jars. Only fill about 1/4 - 1/3 full. Have students shake vigorously approximatley 30 minutes until lumps form. Pour off watery liquid and serve.
2. Tour school kitchen during lunch bread-making process.
3. Ask the kitchen supervisor to be a guest speaker for your class.
4. Tour a local bakery.
5. Sprout wheat seeds that are attached to Wheat Facts post card. After the bread is removed from the pan, plant the seeds in potting soil about 1/4" - 1/2" deep.
6. Make popped wheat in the classroom. The recipe is provided in teacher packet.
7. Grind wheat while the bread is rising.

EASY WHEAT BREAD

Mix in a heavy duty plastic bag:

1/2 cup all-purpose flour
1 pkg. yeast
1/2 cup warm water
2 tablespoons sugar

Work bag with fingers until completely blended. Close top of bag and rest 15 minutes.

Add:

2 cups whole wheat flour
3/4 cup warm water
1 tablespoon vegetable oil
2 teaspoons salt

Mix well. Slowly add enough all-purpose flour to make a stiff dough, 1-1 1/2 cups. Turn dough out onto floured surface. Knead 5-6 minutes. Add more flour if too sticky. Cover with plastic bag. Let rest 10 minutes.

Shape and put in greased pan. Cover again with bag and let rise 45-60 minutes. Bake 30-35 minutes in 400 degree F oven.

Remove from pans, cool on wire rack.

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CULTURAL BREADS

BREAD THE WORLD OVER

UNIT 8

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

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PURPOSE

Children will learn the importance of bread and wheat in our world.

SUMMARY OF LEARNING ACTIVITIES

Activities in this unit focus on learning about:

1. History of wheat, bread and bread baking.
2. Breads from different countries and cultures.

OBJECTIVES

After completing this unit, the student will be able to:

1. Understand somewhat the importance of wheat in our world.
2. Name breads from different countries around the world.

VOCABULARY

Names of breads from different countries.

ACTIVITY 1

HISTORY OF BREADS

SUPPLIES NEEDED:

Some utensils used in wheat grinding and bread baking.

Pictures from history books of people raising and harvesting wheat. Early Native American series might be a good source.

RESOURCES NEEDED BY TEACHER:

Information - WHEAT FOR THE WORLD
HISTORY OF BREAD BAKING
BREADS AROUND THE WORLD
Cookbooks, pictures, history books.

ADVANCE PREPARATION:

Arrange for a grandparent or senior citizen to come to the class and talk about baking bread when they were a child.

Arrange for a senior citizen farmer to come to the class and talk about farming when he or she was a child.

Arrange for a trip to a museum if appropriate.

Collect some cookbooks with pictures, especially bread cookbooks.

Collect utensils used in baking bread and wheat grinding.

Collect pictures.

Arrange for an antique collector to bring antique utensils to class and discuss with children.

WHAT TO DO:

Talk to the children about the history of wheat and bread using the resource materials provided.

Have children talk with grandparents or older friends about bread baking when they were children and have them share with class.

If you have utensils used for baking, demonstrate their use and discuss with children.

If you have antiques or are an antique collector, demonstrate uses of utensils and discuss with children.

Plan a field trip to museum and discuss antique farm implements with them.

Plan a field trip to a bakery.

ACTIVITY 2

BREAD THE WORLD OVER

SUPPLIES NEEDED:

Pictures of breads from different countries.

Cookbooks that include history and recipes of breads from other countries, an example is the Time/Life Foods of the World Series.

Samples of different breads you can discuss, if you can.

RESOURCES NEEDED BY THE TEACHER:

BREADS THE WORLD OVER - Background information sheets.

Cookbooks

Bread samples.

ADVANCE PREPARATION:

Collect cookbooks

Collect pictures of bread or magazines.

Arrange for a field trip to a bakery or international food shop.

Arrange for a grandparent or a senior citizen to come and talk about their ethnic background and the different breads, cakes, cookies that are typical.

Arrange for a grandparent or senior citizen to come and talk about special breads for holidays.

WHAT TO DO

Talk with the children about the breads from different countries.

Visit a bakery or an international food shop and see how many different kinds of bread can be found. Discuss what they contain and how they are made and used.

Have children interview parents, grandparents, neighbors, especially those from different ethnic backgrounds or countries. Using the Activity Sheet, have them find out family customs involving breads, cakes and other wheat products.

Questions they might ask:

What kinds of bread they ate as children.
What kinds of grains were used.
How it was made and how it was eaten.
Was the bread used for a family or community celebration.

Have the children report and share stories if they are able to complete the assignment.

Have interested children bring breads from their ethnic backgrounds into class to share. Have them tell about the bread. Children need to develop a sense of identity in our society and this is an excellent way of relating family history and giving them a sense of belonging.

Have children research in the library, breads and customs from their ethnic background.

Give children the Activity Sheet - International Breads. Have them answer and then discuss the answers with them. This could be an individual activity or team activity.

BACKGROUND INFORMATION

WHEAT - FOOD FOR THE WORLD

One of the most important cereal grains available in the world today is wheat. It provides more nourishment for the people of world than any other food. Because of the nourishment it provides, it is also one of the most economical foods available. With increasing populations, it would be impossible to feed the people of the world without economical grains, and particularly - WHEAT.

Although we consider wheat an important food today, it has an even greater place in history. Humans grew wheat as a food source long before they learned to keep records. The story of bread as a food source is the story of wheat. Every bite of bread has a taste of history. If you follow the development of breadmaking, you'll get a pretty complete course in history.

BREAD AND BREADMAKING

Archaeologists have found a form of bread made from coarse-ground grain which they date as being made around 10,000 years ago. The place was the area we now know as Egypt, where wheat first grew wild as a grass.

No one knows who made the first loaf of bread at the beginning of civilization.

Most likely the first breads were unleavened and baked by the sun. Bread, as we know it today as a loaf made from grain with leavening, was probably first made by the Egyptians. Some historians give credit for it to the Chinese. Egypt is generally recognized as the place where leavened bread was first made. Ancient Chinese writings describe the growing of wheat 2,700 years before Christ.

The Egyptians usually get credit for inventing the oven for baking bread and discovering the use of leavening. They were the first to discover that the dough would rise if they let it stand and ferment before baking. This method of leavening bread is the sour dough method. Bread baking improved greatly from these inventions. Very often bakers competed with each other in creating fancy loaves of bread to be used in offerings to pagan gods. Drawings of bread loaves can be found in the tombs of the Pharaohs in the Valley of the Kings.

Bread was also used as money on occasions. History records that the Egyptians paid the slaves who built the pyramids with three loaves of bread and two jugs of beer a day for their work. Tombs of the ancient Egyptians have murals showing the planting and harvesting of wheat, the grinding of flour and the making of bread. Some of the tombs were even stocked with wheat and bread.

The custom of using bread traveled to Greece and there are many classical allusions to bread in Greek literature. The Greeks also used a great variety of grains such as wheat, barley, rye, millet, spelt and rice, and sometimes combined them with other substances such as flour or dried lotus roots and the root of the cornflag which gave it a sweet flavor. Greek historians record the different kinds of wheat growing along the Mediterranean Sea. The Greeks perfected the milling and baking methods used to make bread. Because they improved milling and baking methods, bread became very popular and the first public bakeries were opened in Greece.

From Greece, the custom of bread baking spread to the Romans. The Romans improved the cultivation of wheat and developed new varieties. They also are responsible for spreading the invention of bread to all of their conquered lands in Europe. In ancient Rome, there were many public bakeries, many of them run by Greeks who had the reputation of making the best bread.

Written records show the progressive development of the art of milling and baking in Greece and Rome.

BREAD AND RELIGION

As mentioned above, Egyptians made offerings of loaves of bread to their gods. In some parts of China, even today, wheat is considered a sacred crop. In trying to understand the power of why the dormant seed would swell and burst out in new life in the spring, early humans made it an object of primitive worship. The Egyptians believed that grain, milling and bread baking were discovered by their gods. The Greeks had a "bread goddess", Demeter, who ruled agriculture and explained the changing seasons with the story of Persephone, who had been kidnapped and made to live in Hades, the underworld, during the autumn and winter of each year. The Roman equivalent of Demeter was Ceres, for whom cereal grains are named.

Our civilization was based on agriculture in the very beginning. The Bible has numerous passages mentioning farming and the sowing, harvesting, milling and uses of wheat. As humans moved into the Christian era, bread continued as the staff of life. Jesus taught his followers the prayer which mentions, "Give us this day our daily bread". Instead of offering loaves of bread to heathen gods, early Christians made fancy loaves for feasting on church holidays, such as Christmas and Easter, and to give thanks at the end of the harvest, sort of like Thanksgiving. This reverence for wheat continues today in the Lord's Prayer and in the wafers of the Eucharist. In the Hebrew faith, the eating of unleavened matzoth during Passover marks the significance of bread in religion.

Bread still holds a place of high esteem and sanctity in parts of Europe. If a child drops a piece of bread, he or she is to pick it up and brush it off and eat it reverently. Bread is still called "The Staff of Life" which gives us a sense of dependence on the products of wheat.

BREAD IN AMERICA

In colonial times, corn was more plentiful in America than wheat and so corn bread was more common than wheat bread. American Indians friendly with the colonists showed them how to grow corn and prepare it to eat. The cooking techniques were improved on by the pioneer women who brought bread baking techniques with them from Europe. People traveling by foot and horseback often slept and ate in the forests they were traveling. The main food that they carried was corn bread. That is why corn bread was called journeycake. When travel became more advanced with roads and taverns being built and stage coaches carrying passengers, somehow a transition was made and journeycakes began to be called johnnycake. Johnnycake is still the term used by easterners for some types of cornbread.

There are various breads made from cornmeal and every region of the country has its own specialty. In frontier America, corn bread was made from cornmeal and water only and baked in a pan, this caused early settlers to call it corn pone. Southerners mostly used white cornmeal and northerners yellow cornmeal.

A favorite in the South was light and tasty spoon bread. On the frontier, pioneers made salt rising bread when they ran out of leavening or yeast. Another favorite yeast-leavened corn bread is Anadama Batter Bread. This was first made by a Massachusetts fisherman who was tired of eating cornmeal mush. He took the cornmeal mush, added molasses and yeast and baked it like a loaf of bread while muttering: "Anna-dam-er, Anna-dam-er" or so the story goes. This is served toasted and is still a favorite in New England.

Among the early breads eaten by the colonists is the famous Southern Beaten Biscuit. These are tiny, thin biscuits that start out as a stiff dough and then are beaten with a mallet, rolling pin, hammer or some other instrument until it blisters and becomes smooth. Hostesses making beaten biscuits would beat the dough 100 times for everyday meals, but would beat 200 times for company. Today there is a machine that does the beating.

America's Yankee Sourdough Bread was made by early prospectors and miners called "Sourdoughs" because of they way they made their bread. Sourdough gets it name from the leavening used. This is called a sour dough starter and called that because it is a mixture of liquid and flour which stands at room temperature for 2-4 days until it bubbles and gives off a sour aroma. This was a staple for the pioneers in the Old West and the starter was kept going all the time. It is not an easy thing to make and that is why few people make it today. In fact, in pioneer days, ranchers and miners rode or walked miles to get a starter from a friend or relative. The sourdough starter gives a characteristic flavor to the bread, biscuits and pancakes made from it.

Another historic bread in America is Boston Brown Bread. This is a quick bread that is steamed and in New England is usually served with baked beans. Beans and Brown Bread was a traditional supper for Saturday night in the days of the Puritans.

BREADS AS PART OF CULTURE

History shows that bread has been around since the beginning of civilization. It has played an important part in civilization and continues to be an important part of the diets of people around the world.

Each nation has its own distinctive breads. Some are favorites because they are associated with holidays, religious ceremonies and good times. Plump round, long or flat, a crusty loaf of fragrant golden

brown bread sparks a welcome glow in every home. Bread serves as a link between cultures. Who would have believed that the average person would be using bagels, pita bread or croissants as part of the daily diet? Like the breads mentioned, other cultures contribute their own special breads to our American diet and . . they are all made from wheat.

Breads vary from one country to another, but they also have breads that are the same, but are called by different names. Breads around the world represent the peoples who bake them. People create regional and national favorites using the flours and grains they have which give them a variety of flavor and character.

FLAT BREADS

Flat breads are made in many different countries. The ones we know come to use mainly from the Middle Eastern countries and from South America. Flat breads are easy and fun to make. Here is a list of the more popular ones and the country that they come from:

BARBARI is popular in Iran. It is flat and oval shaped.

TUNISIAN bread is from Tunisia and is flat and round.

MARRA QUETA is from Chile. It is a tasty French-type roll.

POCKET BREAD or **PITA BREAD** is from Egypt and the Middle East. It is a round and flat bread that puffs up when baked and has an air space that can be stuffed. That is why it is called "pocket" bread.

LAVASH comes from Iran and Turkey. It is a paper thin white bread. It is often served with soup or salad.

TORTILLAS come to us from Mexico and can be made of flour or corn meal.

KRUMKAKER from Norway is a flat cookie that is made in a waffle iron type utensil.

KNACKEBROD is a hard, flat bread from Sweden.

PARATHES is an unleavened wheat bread from India.

CHAPATTIS from India are flat breads that are made from patties of dough slapped between the hands and then pressed onto a hot surface to bake. They are very similar to tortillas.

WONTONS from China are flat, thin sheets of dough that are used to make eggrolls and wontons.

KHOUBZ ARABY is the Arab version of flat bread.

NON is a flat bread from Russia.

MATZOH from Israel is often used in religious ceremonies and looks a lot like a cracker.

DINNER BREADS

Dinner breads of many countries are brought "home" by travelers returning to the United States. The dinner breads that they like so much when they are traveling and miss when they get home are usually lean and breads which are not too sweet. They are popular because they don't overpower the flavor of the rest of the meal and they are less filling. Some examples of these breads are:

DONA EVA'S ROLLS—This Columbian dinner roll, has a high percentage of egg and is typical of the breads of northern South America.

PISTOLETS from Belgium are very popular with travelers.

TIJGERBROOD or tiger bread from the Netherlands is a unique bread. The Dutch word for bread is brood. It is called tiger bread because of the paste that is brushed on before baking.

CROISSANTS are a favorite in America today and originate from France. They are very flaky and called croissants because they are crescent shape.

England provides us with a variety of roll type breads such as: **SALLY LUNN** and **BISCUITS,** small rolls to be eaten with a meal.

POPOVERS AND YORKSHIRE PUDDING are mixtures of dough that use eggs as leavening and puff up a great deal. The difference is that **POPOVERS** are individual serving sized and **YORKSHIRE PUDDING** is large and is cooked in the same pan that meat has been roasted in to absorb some of the meat flavor.

CREAM PUFFS and **ECLAIRS** are the sweet version of popovers from France.

GRISSINI from Italy are really just bread sticks, but are a famous wheat product that has become very popular in the United States.

BAGIS from Scotland is a round breakfast roll.

POLENTA from Italy originated in early Roman times and was the stape for Caesar's army. Originally made from wheat, it is now usually made from corn meal. It is very similar to what we call spoon bread.

PIZZA is not really a bread but deserves to be mentioned here because it is served as a dinner. Of course, it originally comes from Italy.

PIROZHKI are meat filled pastries from Russia.

KHACHAPURI from Russia is a bread made with cheese.

HUA CHUAN is a steamed bread dough that is rolled to look like a flower and is from China.

DIM SUM in China is the name given to snacks made with dough and filled with various fillings that are steamed rather than baked.

WHITE BREADS

White bread was the best in the eyes of the people of the wheat countries. History shows that there has always been a search for status. Early kings and noblemen were often judged by their private bakeries and the freshness of their breads. In fact, white bread was the ideal in the wheat countries of Hungary, Austria, England and America.

VIENNA BREAD - During the 19th century the Viennese bakers established a reputation for fine white breads, cakes and confections that is still unsurpassed

today. This was made possible because of the white flour from Hungary that was produced by a new roller mill process, plus the influence of the art and music and the elegant Hapsburg Court.

In France, rye bread remained firmly entrenched with the peasants, but the crispy white **BAGUETTE** was favored by the bourgeoisie.

The white bread favored in Ireland is made differently. It uses baking soda as the leavening agent instead of yeast and that gives it its name, **IRISH SODA BREAD.**

GEBILDBROTE is bread that has a picture made in the dough from dough. It's from Germany and is used for festive occasions.

CHALLAH is a braided white bread popular in Israel.

RYE BREAD

Rye bread was the staple of Poland and Russia, Germany and Scandinavia because it was too cold to grow much wheat. Rye bread is made with a combination of rye and wheat flour, flavored with caraway seed. It is a favorite Northern European bread. **DARK PEASANT BREAD** is a variation of rye bread. It is sweet, sour and almost spicy in flavor and is a solid loaf of rye bread. When eating this bread, the peasants of these countries really knew they were eating. Rye bread was often kept in the table drawer of the farmhouse kitchen in the 18th century.

WHOLE WHEAT BREAD

A firm loaf of whole wheat bread with its nutty, sweet and wheat flour was a staple of the 16th and 17th centuries. The enjoyment of this natural, coarse-textured bread is a favorite of many people today.

PURIS from India is a deep-fat fried, unleavened whole wheat bread.

SCHROTBROTE is the name for whole wheat bread in Germany.

FRUIT BREADS

The variety of fruit breads is as numerous as the countries in the world. Most countries have a favorite fruit or sweet bread special to their people. Fruit breads contain dried fruit, nuts, and spices. Most of the fruit breads that we know originate in southern Germany. Some examples are:

HUTZELBROD - This looks like a Christmas bread with its shiny glaze, but is differs from most holiday breads in that the fruits are dried and not candied.

KOLACKY - Czechoslovakia is responsible for these fancy little fruit filled cakes. The Czechs like to poke holes in dough and fill the holes with dried fruit, cheese or jam. Kolacky is particularly popular on the U.S. west coast where many of the Czech settled.

BLACK BUNS are a fruitcake type bun from Scotland.

ECLES CAKES and **BANBURY CAKES** from England are envlopes of pastry filled with dried fruit and spices.

SHAHITUKRA is a fried bread and nut dessert from India.

STOLLEN from Germany is a fruit-filled bread.

JULEKAGE is the Christmas fruit loaf from Denmark.

LIMPA is a fruit bread from Sweden.

CAKES AND COOKIES

Since the discovery of wheat and the invention of milling and baking, humans developed the sweet versions of bread that we know today as cakes and cookies. Each country has it's own favorite specialties and some of them we know in the United States. Here are just a few that you may know:

DUNDEE CAKE and **SHORTBREAD** from Scotland are favorite as snacks.

CRUMPETS from England are little cakes that are fried in a skillet and usually served with tea. You know, tea and crumpets!

HOT CROSS BUNS from England are a favorite at Easter time.

JALEBIS from India is a pretzel-shaped sweet that is fried in oil.

PENNETTONE is a coffee cake form Italy.

KULICH is an Easter cake made with nuts and raisins from Russia.

BAKLAVA is a pasty from Greece made with many layers of phyllo, very thin sheets of dough, filled with walnuts or pistachios and honey syrup.

CHURROS are crisp fried crullers (doughnuts) from Spain.

STRUESEL is a sweet coffee cake-type of cake from Germany.

WIENERBROT is what the Danish people call what we call Danish pastry.

TIPPALEIVAT are cruellers made for May Day celebrations in Finland.

NAAN is a sweet bread from Pakistan.

An interesting note is that in China most people eat wheat, but not usually as bread. They have **Mein** or **Noodles** made from wheat that is served with other dishes. Have you ever hear of chow mein noodles?

PANCAKES

Pancakes are popular in many countries and each country has its own version.

CREPES are the French version. They are very flat, not like what you get here and can be filled with sweets or meats for dinner. Have you ever heard of Crepes Suzette?

BLINI are the Israeli version. They are usually filled with a cheese mixture and served with a sweet sauce.

BLINY are a buck wheat version of the pancake from Russia. They are similar to the Israeli blini, filled with cheese and served with sauce.

BURRITOS and **ENCHILADAS** are the Mexican version and are usually filled with meat, beans or cheese.

THE HISTORY OF BREAD

Fill in the blanks with the correct word(s) to complete the sentence.

Sourdough	Journey Cake
Greece	Egypt
China	Corn Pone

1. The first bread was made in _____ or _____.
2. The Egyptians were the first to discover that the dough would raise if they let it sour or ferment before baking. This was the first _____.
3. The first public bakers were in _____.
4. In frontier America, bread made from meal and water and baked in a pan was called _____.
5. Johnny Cake was an American Indian bread, sometimes called _____, because it was often carried by travelers.

ANSWER SHEET
STUDENT ACTIVITY SHEET — BREAD THE WORLD OVER

THE HISTORY OF BREAD

Fill in the blanks with the correct word(s) to complete the sentence.

Sourdough	Journey Cake
Greece	Egypt
China	Corn Pone

1. The first bread was made in CHINA or EGYPT.
2. The Egyptians were the first to discover that the dough would raise if they let it sour or ferment before baking. This was the first SOURDOUGH.
3. The first public bakeries were in GREECE.
4. In frontier America, bread made from meal and water and baked in a pan was called CORN PONE.
5. Johnny Cake was an American Indian bread, sometimes called JOURNEY CAKE because it ws often carried by travelers.

STUDENT ACTIVITY SHEET — BREAD THE WORLD OVER

INTERNATIONAL BREADS

How many breads from other countries do you know? Write the country next to the correct bread.

China	Czechoslovakia	England	France
Germany	India	Ireland	Israel
Italy	Japan	Mexico	Middle East
Pakistan	Russia	Scotland	Sweden

BREAD	COUNTRY
Kolaches	_____
Biscuits	_____
Stollen	_____
Irish Soda Bread	_____
Grissini	_____
Naan	_____
Tortillias	_____
Pan	_____
Koulitchey	_____
Hua-chuan	_____
Baguette	_____
Scone	_____
Pita	_____
Chapatti	_____
Limpa	_____
Challah	_____

ANSWER SHEET

STUDENT ACTIVITY SHEET — BREAD THE WORLD OVER

INTERNATIONAL BREADS

How many breads from other countries do you know? Write the country next to the correct bread.

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Pan	Japan
Koulitchey	Russia
Hua-chuan	China
Baguette	France
Scone	Scotland
Pita	Middle East
Chapatti	India
Limpa	Sweden
Challah	Israel

STUDENT ACTIVITY SHEET — BREAD THE WORLD OVER

BREAD AND CUSTOMS

Bread plays an important part in family, ethnic and cultural customs. Does your family or community have any customs involving bread? Please write those customs in the space below.

FAMILY CUSTOMS: _____

_____

_____

_____

COMMUNITY CUSTOMS: _____

_____

_____

_____

BREAD TEASER

Do you know these customs using bread?

- In ancient times, Egyptian bread was a symbol of truth. Persons took a sacred oath with their right hand touching the top of the loaf.
- Jews use special flat bread called matzos for Passover.
- Orthodox Russians have special bread called Koulitchey for Easter.
- In Latin America on All Soul's Day, the dead are remembered by bread offerings which are taken to the cemeteries. Gifts of bread are also made by the living and given to each other.
- In Germany, St. Nicholas Day is celebrated with a sweet dough made into the shape of his helper, Peter, carrying a bundle of twigs.
- In Sweden, the bride and groom eat a whole wedding bread to symbolize a faithful and happy marriage.

GLOSSARY

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

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ALL-PURPOSE FLOUR: Finely ground endosperm of the wheat kernel separated from the bran and germ during the milling process. Made from hard wheats or a combination of soft and hard wheats. All-purpose flour is enriched and can be bleached or unbleached.

AWN: Small straight extension of the hull around the outside of the grain kernel on some plants. Similar to a brush bristle in appearance.

BARGE: Long flat rectangular boat used for hauling cargo up and down rivers.

BARLEY: Spring annual (in Nebraska) cereal grain. Member of grass family. Seed is approximately 3/16" long, oval in shape and has a wrinkled appearance. Color is a light brown in appearance. Grain head type is spike. Two main types of barley are feed and malting. Feed barleys used for livestock consumption, malting barleys often provide the base for beers. Small amount of barley for human consumption.

BEARD: A group of awns on the spike of a plant.

BIN: Storage unit for the grain. Usually a building of one type or another.

BRAN: Coat of the grains and associated tissue.

BREAD FLOUR: Ground from the endosperm of the wheat kernel. Although similar to all-purpose flour, it has a greater gluten strength and is generally used for yeast breads.

BUSHEL: A volumetric unit of measure for grains, consisting of 1.25 cubic feet. Used by farmers and elevators to buy and sell grain. Weight per bushel for the following crops:

Wheat	60 lbs./bu.	Rye	56 lbs./bu.
Corn	56 lbs./bu.	Barley	48 lbs./bu.
Milo	56 lbs./bu.	Popcorn	56 lbs./bu.
Oats	32 lbs./bu.	Millet	50 lbs./bu.

CAKE FLOUR: Milled from soft wheat and is especially suitable for cakes, cookies, crackers, and pastries.

CARBOHYDRATES: Efficient source of energy for the human body.

CARBON DIOXIDE: Gaseous product of yeast growth.

CHAFF: Small plant parts that are broken away from around the outside of the seed in the threshing process. When chaff combines with other types of grain dust it can provide the fuel for a grain elevator explosion.

COMBINE: Farm implement used to harvest grains. It consists of a threshing section, to remove the grain from the seed heads; a separating section to sort the small particles (grain and chaff) from the straw, stems, leaves and stalks; and a cleaning section to remove the light chaff from the heavier grain.

COOPERATIVE: An organization of farmers that combine their resources to operate an agribusiness such as a grain elevator or a milk and cheese processing plant. Any profits made by the co-ops (cooperatives) is then divided between its farmer-members.

CORN: Annual cereal grain. Member of grass family. Seed size varies from flat to round, often flat with a triangular appearance. Color of dent type corn may be white, red, or yellow, with yellow being the most common. Yellow corn **is most commonly used for livestock feed.** Grain head type is pistillate. White corn is often used for milling purposes in human consumptions.

DRILL: A farm implement that is used to plant small grain seeds such as wheat into narrow furrows and cover them with soil.

ELEVATOR: A facility or business that has many grain bins to store the grains from many different farmers.

ENDOSPERM: The starchy interior of the grain.

FARINA: Coarsely ground endosperm of hard wheats. It is the prime ingredient in many American breakfast cereals. (A box of Cream of Wheat also states, "Enriched Farina").

FAT: Provides warmth, power to move, healthy skin and cushions for body organs.

FIBER: Undigestable carbohydrate in food.

FLOUR: Finely ground meal of grain.

GELATINIZATION: To convert into a form resembling gelatin or jelly. The process of heating a starch and water solution to swell granules so that the solution becomes translucent and thick.

GERM: Embryo or seedling plant in the grain.

GLUTEN: The name given to the protein part of wheat. It is that part of the flour which gives it the elastic properties needed for making bread.

GRAHAM FLOUR: Another term for whole wheat flour.

GRAIN:

1. A crop that is raised for the seeds to be used in human or animal consumption.
2. The product of a crop that is raised for the seeds.
3. A group of seeds of one or more different types.

GRAIN HEAD: Structure on the plant where the grain is formed. Located at the top of plant for all the grains except corn. Corn has the male portion of the plant at the top (tassel) with the female portion located about half way to the ground where the seed is formed.

HARD WHEAT: Wheat in which the endosperm tends to break between the cells producing a flour that is granular to the touch and free flowing. It also has a high protein content.

HARD WHEAT FLOUR: Flour made from hard wheat. It has a high protein content that forms an elastic gluten with good gas-retaining properties. Hard wheat flour is suitable for the production of yeast-leavening bread.

HEADING: The growth stage when the grain head emerges above the last leaf on the plant.

IRON: With the help of copper, iron combines with protein to form hemoglobin.

KERNEL: The individual grain seed of most cereal crops.

KNEAD: To manipulate with a pressing, folding and stretching motion. With the palm of your hand, press the dough to flatten, fold in half, press again to flatten and repeat.

MILLET: Annual cereal grain. Similar to milo. Often grown where the growing season is short and moisture is limited. Seeds will have similar appearance to milo. Grain head type is closed panicle. Most commonly used for livestock feed and bird seed.

MILO (Grain Sorghum): Spring annual cereal grain. Member of grass family. Seed is round, about 1/8" in diameter. Color ranges from tan to dark reddish brown. Grain head type is closed or semi-closed panicle. Grain most commonly used for livestock feed.

NIACIN: Essential for efficient use of protein by the body.

OATS: Spring annual cereal grain. Member of grass family. Seed is 3/8" to 1/2" in length and color varies from off white to light brown. Grain head type is open panicle. Principal use is in livestock feeds with a small amount being used for human consumption. Excellent source of dietary fiber.

POPCORN: Annual cereal grain. Member of grass family. Seed is often round, often 1/4" in diameter. Grain head type is pistillate. Popcorn has been selected for its ability to expand the starchy endosperm rapidly when heated to provide a light crunchy snack food. Principal use is in human consumption.

PORT: Location where cargo is loaded or unloaded onto some type of water transportation.

PROTEIN: Essential for tissue maintenance and growth.

RESTING: To stop the kneading action and let the dough set idly.

RIBOFLAVIN: Essential for growth and good vision and helps the body make use of carbohydrates, fat and protein.

RIPENING: The period after which all the nutrients that will be placed into the seed by the plant have taken place and the seed begins to decrease in moisture until harvest.

SOFT WHEAT: Wheat in which the endosperm tends to be pulverized so that few or no whole cells are left. The flour is softer to the touch and tends to clump together. Its protein content is lower than for hard wheat.

RYE: Winter annual cereal grain. Member of grass family. Seed is about 3/8" long, oval in shape and is reddish brown in color. Grain head type is spike. Principal use is for rye flours for human consumption with poorer quality grain being used for livestock consumption.

SEED: The individual kernel of a cereal grain, or the structure by which many plants reproduce. Most seeds consists of: the germ or embryo of the seed, which contains the genetic material for the next generation to grow; the endosperm for nutrition of the embryo, and the hull which encloses the outside of the seed.

SELF-RISING FLOUR: An all-purpose flour with salt and leavening, such as baking powder, added.

SHOOT: The first part of the plant to appear above the ground after germination.

SOFT WHEAT FLOUR: Flour made from soft wheat. It has a low protein content and has poor gas-retaining properties. It is usually used for making quick breads, cakes and cookies.

SPIKE: Grain head type of small cereal grains. Consisting of a central axis (stem) from which the seeds are attached. Examples are wheat, barley, and rye.

SPIKELET: Small branch which extends from the spike to the grain kernel.

STARCH: A white, odorless, tasteless, powdery complex carbohydrate that is the chief storage form of carbohydrate in plants. It is an important substance with food value.

THIAMIN: B Vitamins - needed for good appetite, digestion and healthy nerves. Thiamin helps the body make better use of fat and carbohydrates.

THICKENING: The act of making a liquid thick or more dense.

THICKENING AGENT: Something used to thicken, like flour in a gravy.

TILLAGE: The act of moving the soil by a machine or implement to prepare the ground for planting or to destroy the root systems of undesirable plants.

TILLERING: The ability of a plant to grow multiple stems from the same plant base to compensate for favorable growing conditions.

TRANSPORTATION: The method of moving anything from one point to another. Transportation often makes up about one third of the cost of grain that is moved to other areas of the country.

TRUCK: Motor vehicle for hauling cargo. Semi-trailers usually hold about 40,000 lbs. of grain.

UNBLEACHED FLOUR: Is bleached by oxygen in the air during an aging process and is off-white in color. Nutritionally, bleached and unbleached flours are equivalent.

UNIT TRAIN: A train that hauls only one type of commodity at a time, such as coal, wheat, corn, etc. The advantages of unit trains are that they are able to fill and unload quickly thus making them faster and cheaper to operate.

VERNALIZATION: Certain crops that require a cold or frozen period during their growth to change from a vegetative stage (leaf and root growth) to a reproductive stage (seed formation).

WHEAT: Annual cereal grain. May exist as either a winter or spring annual. Member of grass family. Seed is oval shaped approximately 3/16 of an inch long. Color will range from off white to dark reddish brown. Grain head type is spike. Grain is principally used for human consumption.

WHEAT BERRY: The entire grain of wheat. Also known as a kernel.

WHOLE WHEAT FLOUR: A coarse-textured flour ground from the entire wheat kernel containing bran, germ, and endosperm. Baked products made from whole wheat flour tend to be heavier and denser than those of white flour because the presence of bran reduces gluten development.

YEAST: The leavening agent for breads which makes them rise and makes bread light. Yeast is a living plant which feeds on the sugar in dough and produces the gas that makes the dough expand and rise.

YIELD: A measure of the production of a certain crop. Normally most grain crops are expressed as bushels per acre, or bushels in a state or nation.

ZINC: Important for skin healing and growth properties.

Student/Member Activity Sheets

These sheets are designed to be reproduced for classroom/meeting use by students.

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_____

Date

Dear Parents/Guardian,

During the next two weeks our class will be studying the importance of wheat in our food supply and our daily diets.

Students will learn the steps taken from the planting of the wheat seed to the arrival on our breakfast, lunch and dinner tables. Many exciting and informative activities are planned.

Your cooperation will be needed to help supply nutrient labels from wheat products that are used by your family.

We hope these activities will help promote an awareness and appreciation of the wheat growth in Nebraska.

Thank you.

_____

Teacher

STUDENT ACTIVITY SHEET I-2

Match the following seed head structures with the grain that best fits the description.

HEAD TYPE

A Spike

B Open panicle

C Closed or semi-closed panicle

D Pistillate

GRAIN TYPE

_____ WHEAT

_____ CORN

_____ OATS

_____ MILO
(GRAIN SORGHUM)

_____ MILLET

_____ POPCORN

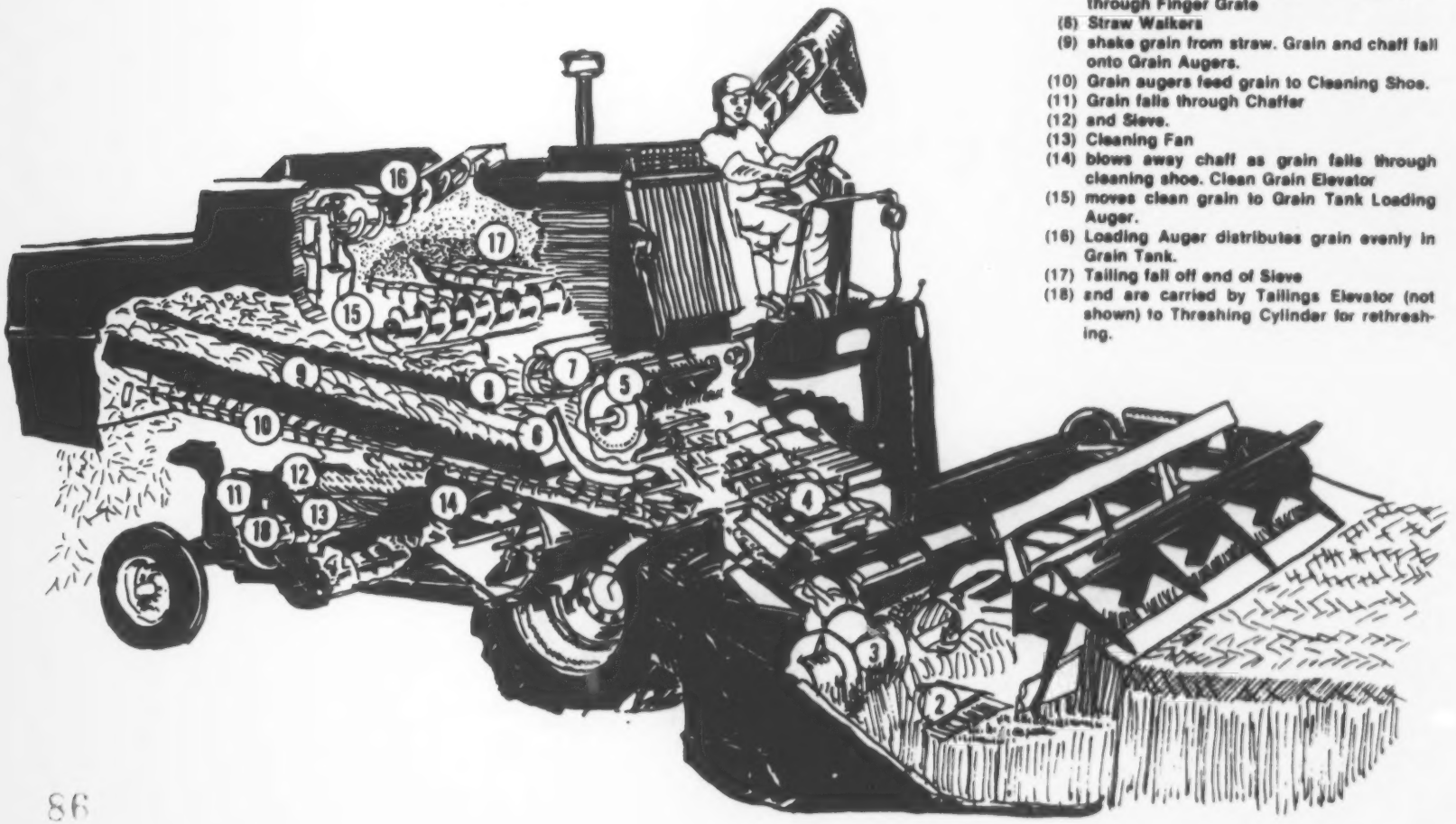
_____ RYE

_____ BARLEY

BASIC COMBINE OPERATION

The Reel

(1) holds crop against Cutterbar
(2) Cutterbar cuts crop. Reel pushes crop into path of Auger
(3) Auger moves crop to Feeder Conveyor
(4) Feeder Conveyor delivers crop to Threshing Cylinder
(5) Threshing Cylinder and Concave
(6) thresh crop. Rotary Deflector
(7) strips straw from cylinder and deflects grain through Finger Grate
(8) Straw Walkers
(9) shake grain from straw. Grain and chaff fall onto Grain Augers.
(10) Grain augers feed grain to Cleaning Shoe.
(11) Grain falls through Chaffer
(12) and Sieve.
(13) Cleaning Fan
(14) blows away chaff as grain falls through cleaning shoe. Clean Grain Elevator
(15) moves clean grain to Grain Tank Loading Auger.
(16) Loading Auger distributes grain evenly in Grain Tank.
(17) Tailing fall off end of Sieve
(18) and are carried by Tailings Elevator (not shown) to Threshing Cylinder for rethreshing.



Careers Involved In Market Structure For The Production and Marketing of Wheat

A list of businesses and professions involved in the complex economic system that produces wheat and its many end products more efficiently and economically than anywhere in the world.

Seed Production

- Research - Plant Breeder, Experimental Farm Manager, Experimental Milling & Baking by University and USDA Scientists
- Seed Production - Grower, State Crop Improvement Association, Seed Cleaning, Firms, Seed Treatment and Chemicals
- Seed Marketing - Producer, Seed Companies, Seed Salesmen, Transportation, Storage

Wheat Production

- Grower
  Landlord, Land Owner
  Farm Machinery Supplier - Manufacturer, Dealer
  Irrigation Equipment Supplier
  Supplier of Fuel, Tires, Batteries, etc.
  Supplier of Fertilizer - Manufacturer, Dealer
  Custom Spreading Equipment
  Ag Chemical Supplier for seed control
  Custom Combine Operator
  Transportation, Truck
  Insurance Crop - Local Agent, Company, U.S. Government
- Trade Association - Wheat Growers Association
  U.S. Wheat Growers Association
  The Wheat Quality Council

Wheat Storage

- Grower - On Farm
  Suppliers of storage bins and handling equipment such as augers, elevators
  Suppliers of aeration and drying equipment
  Sanitation technicians, management, research
  Suppliers of chemicals for insect control and equipment for application such as sprayers, probes, etc.
  Suppliers of temperature monitoring equipment
  Commercial storage - country elevator, terminal elevator, port elevators, subterminal elevators

Wheat Marketing

- Grain Buyer - Country Elevator, Subterminal, Terminal, and Flour Mill
  Grain Broker
  Grain Merchandisers
- Grain Inspection - State Grain Inspection Department, FGIS, USDA, Private Agencies and Personnel
- Grain Elevator Operating Personnel - Manager,
  Superintendent,
  Laborers,
  Office Personnel,
  Grain Grader,

	Maintenance, and Accounting
Board of Trade	- Futures & Cash Markets, Kansas City, Chicago and Minneapolis
Grain Standards	- USDA
Research - USDA	- Grain Marketing Research Center, Universities Economic & Marketing
Trade Association	- Nebraska Wheat Board U.S. Wheat Associates National Grain & Feed Association Grain & Feed Association
Grain Market Statistics	- Crop Reporting Service USDA - Crop & Livestock Reporting Service Economic Research Service Foreign Agricultural Service (FAS)
Grain Marketing Programs	- USDA - PL 480 Sales of Wheat & Flour USDA - ASCS Price Support Program County, State, National
Financial	- Local Bank PCA, FLB, Bank for Cooperatives National & International Banks U.S. Government - Guaranteed Payment on Export Sales
Grain Market News	- Newspaper, Trade Papers, Magazines, Radio, Television, Trade letters, Computer Terminals, Telex (Grain Instant News)
Transportation	- Truck, Barge, Ship, Rail
Wheat Utilization-Flour Milling	- Buyer Elevator - Storage, Cleaning, Blending Milling - Superintendent, Laborers Laboratory - Cereal Chemist, Lab Personnel Packaging - Bag Supplier, Equipment Supplier Salesmen Management Office Personnel Transportation - Truck Rail Water Maintenance & Repair Personnel Sanitation - Suppliers of Chemicals and Equipment Service Firms US - FDA
Baking - A. Commercial	Buyer - Flour and other ingredients, package materials

	1. Bakery-Nutritionist	
		Quality Control Supervisor
		Superintendent
		Operating Personnel
		Engineer
		Maintenance & Repair
		General Manager
		Office Personnel
		Accounting
		Personnel Manager
		Salesmen
		Route Drivers
		Advertising & Promotion
		Financing
		Sanitation - A.I.B., Private Firms
	2. In-Store	
	B. Institutional	Schools
		Hospitals
		Retirement Homes
		Cereal and other food manufacturing
		Industrial Uses
		Formula feed manufacture
		- Buyer
Retail Market	- Supermarket	Store Manager
		Bakery Department Manager
		Sales personnel
	Local Bakery	
	Franchise Bakery	
Other Supporting Activities	- 1. Education	- University - Dept. of Grain Science & Industry
		Community Colleges
		Vocational Schools
		A.I.B.
		Primary, Secondary Schools
		Trade Associations
	2. Regulatory	State Agriculture Department
		Weights & Measures
		Health
		U.S.D.A.
		F.D.A
		Sanitation, Nutrition Standards
	3. Clerical & Accounting	Secretarial
		Business Machine operators
		Computer personnel
		Sales
		Service
		Management
	4. Communications	Telephone
		Telex
		Mail Room
	5. Weather Forecast	U.S. Weather Service
		Private Weather Forecasters
		News Media
		Radio
		Television
		Newspaper

Robert W. Schoeff
June 1982

STUDENT CHECKLIST - ACTIVITY 1

NAME OF PRODUCT _____	% R.D.A.**	1 SERVING
Carbohydrates	_____	_____
Fiber*	_____	_____
Protein	_____	_____
Thiamine	_____	_____
Riboflavin	_____	_____
Niacin	_____	_____
Iron	_____	_____
Zinc	_____	_____
Magnesium	_____	_____

NOTE: Amount of nutrient may be listed in both or only one column.
** Percentage of U.S. Recommended Daily Allowances
* May not be listed on every product

_____
Date

Dear Parent/Guardian,

As part of our activities in the unit on uses of the varieties of wheat flour, it will be necessary for your son/daughter to obtain information at your grocery store.

Attached is the activity sheet that should be used to complete the activity. Many of these flours can be found in your grocery store and others can not. Check off as many as you can find and return on _____.

Optional: List the varieties of wheat flour you use at home.

Thank you for your cooperation.

Sincerely,

_____
Teacher

_____ _____
Due Date Name

ACTIVITY SHEET FOR TRIP TO GROCERY STORE

	STORE	PRICE	BRAND
All Purpose Flour			
Enriched All Purpose	_____	_____	_____
Bleached Enriched All Purpose	_____	_____	_____
Unbleached Enriched All Purpose	_____	_____	_____
Bread Flour	_____	_____	_____
Cake Flour	_____	_____	_____
Self-Rising Flour	_____	_____	_____
Pastry Flour	_____	_____	_____
Gluten Flour	_____	_____	_____
Semolina	_____	_____	_____
Farina	_____	_____	_____
Whole Wheat Flour	_____	_____	_____
Pasta Flour	_____	_____	_____

ADDITION AND SUBTRACTION

Farmers measure wheat in bushels. This is the unit of measure that the farmer, the grain elevator operator, and banker refer to when talking about yield, production, and sales.

1. A farmer at Waverly has three bins of wheat. The first bin holds 7,246 bushels, the second 8,907 bushels, and the third 3,549 bushels. How many bushels do the three bins hold?

2. A large wheat field in Lancaster County produced 4,642 bushels of wheat. A field of the same size in Lincoln County produced 3,477 bushels. How many more bushels were produced in the first field?

3. Ms. Reed, the local banker, needs to keep a record of how many bushels of grain each of her farm borrowers has stored on the farm. Mr. Thomas has two grain bins on his farm. The first bin holds 5,360 bushels and the second holds 4,240 bushels. If Mr. Thomas sells 1,335 bushels how many bushels will Ms. Reed show on the bank records for wheat on hand?

4. The local grain elevator has three large bins that contain 425,000, 382,500, and 438,475 bushels respectively. The elevator loads a 75-car unit train that holds a total of 125,316 bushels. How many bushels are now at the grain elevator?

5. If the farmer in problem 3 sold an additional 1,200 bushels how many bushels would he now have stored on his farm?

6. A farmer has 7 fields of wheat. She needs to total the number of acres so that she knows how much wheat seed to order for planting in the fall. The fields are 23, 19, 82, 45, 28, 15, and 17 acres in size. How many bushels will she need to order if she plants one bushel per acre?

7. The fertilizer dealer delivers three loads of fertilizer to the Jenkins Farm. The loads weigh 10,260 lbs., 9,880 lbs., and 8,940 lbs. How many pounds of fertilizer will the Jenkins Farm be billed for?

8. A farmer has purchased 5 loads of fuel to operate the engine of his irrigation well. The five loads cost $149, $289, $449, $267, and $512. What is his total fuel cost for operating the irrigation well?

DECIMALS: ADDITION AND SUBTRACTION

Most work that farmers do with adding decimals involve money and calculating the differences between sizes of fields, yields, and the production of farm animals.

1. Mr. Thomas hired his neighbor to harvest a field of hay for him because he does not have the equipment to do the job himself. When Mr. Jefferson completed the harvest he billed Mr. Thomas for the costs, $63.50 for windrowing, $109.25 for baling, and $7.65 for twine to wrap the bales. What is the total amount owed Mr. Jefferson?

2. Mr. Jefferson's windrower can cut 60 acres a day. He has three fields that he needs to cut today. The size of those fields is 36.14 acres, 11.48 acres, 9.07 acres. What is the total number of acres to cut today? Will he be able to finish these three fields in one day?

3. Ms. Johnson manages the swine production unit on Mr. Thomas' farm. She is interested in finding out how much better the production is in Barn A as compared to Barn B. Barn A weans an average litter size of 9.13 pigs per litter and the average pig weight is 17.4 pounds. Barn B has an average litter size of 8.79 pigs per litter and the pigs weigh an average of 15.9 pounds. How many more pigs per litter does Barn A average over Barn B? What is the difference in weights of the average pig between the barns?

4. Ms. Johnson hired three students to clean one of the hog barns between groups of pigs. They each worked for different amounts of time. Tim was paid $21.34, Brian $15.83, and Nancy received $20.50. What are the labor costs for cleaning the hog barn?

5. Mr. Thomas sold two loads of hogs at the local hog buying station. He received $5,290.75 for the first load and $3,987.35 for the second. There is a commission fee charged by the station for handling the hogs which comes to $152.25. What is the net amount that Mr. Thomas will be paid for the hogs?

6. Mr. Jefferson is going to sell three large round bales of hay to Mrs. Washington for her horses. Hay is usually sold by the ton, so they had the bales weighed to calculate the selling price. The first bale weighed .897 tons, the second .789, and the third .906 tons. What is the total tonnage that Mrs. Washington is buying?

7. Mr. Jefferson sold 3 loads of wheat to the local elevator. The loads each contained 675.33 bushels, 668.67 bushels and 659.00 bushels. What is the total number of bushels that were taken to the elevator? If the wheat is worth $3.34 per bushel then the loads are each worth, $2,255.60, $2,233.36, and $2,201.06 respectively. What is the total value of the wheat sold to the elevator?

MULTIPLICATION

Agriculture in Nebraska requires the use of multiplication to find answers to problems such as how many of a certain item are needed, what is the estimated production of a crop, or how many people can be served by the production of this state.

1. A cow will eat 22 lbs. of hay a day during the winter when there is no pasture or range available to eat. If there are 2,050,000 cows in the state how many pounds of hay could they eat in one day? If winter snow keeps the cows in the farmlots for 90 days how much hay will be eaten?

2. In 1983 Nebraska farmers raised 3,350,000 acres of irrigated corn. If the average yield is 124 bushels per acre, how many bushels of corn were produced on irrigated farm ground? The same year corn was also produced on non-irrigated ground totalling 1,600,000 acres. The average yield produced was 58 bushels per acre. How many bushels of dryland corn were produced?

3. If a dairy farmer can milk 43 cows per hour in a modern milking parlor, how many cows can he milk in 2 hours? If the average cow produces 45 pounds of milk a day how much milk is produced from 100 cows in one week?

4. A bushel of corn weighs 56 pounds. If an acre of corn produces 124 bushels, how many pounds would this equal? A corn refiner can extract 33 pounds of fructose corn sweetener from a bushel. Therefore, how many pounds of sweetener can be produced from this acre of corn?

5. A pork producer loads 186 hogs onto a truck. If each of these hogs weighs 220 lbs. how many pounds have been placed on the truck? What would the weight be if the hogs had weighed 232 lbs?

DIVISION

Division allows people in agribusiness to calculate their costs per unit for the product they are selling. Complete the following questions. Round your answers to the nearest cent or two digits to the right of the decimal point.

1. The Clarkson Elevator just purchased 610 bushels of wheat from Mr. Calhoun. They wrote a check for $1,891.00. What is the price of one bushel of wheat at the elevator?

2. Thanks to the honey bee, Nebraska is able to produce alfalfa seed from plants pollinated by the bees. If 2,475 lbs. of seed are produced from one field and the seed is valued at $1,980.00 what is one pound of seed worth?

3. A farmer has two fields which are both 25 acres in size. The first field produced 2,400 bushels and the second field produced 2,525 bushels. What is the yield (bushels per acre) in each of these fields?

4. Use the answers in the previous question to help solve this problem. Each field cost $6,125 to produce. What is the farmer's cost per bushel in each of the two fields? (Hint - cost divided by bushels.)

5. Mr. Lincoln has a flock of 260 ewes (adult female sheep) on his farm. This year they produced 364 lambs. How many lambs were produced by the average ewe? The ewes also produced 2,080 lbs. of wool at shearing time. How many pounds did the average ewe shear?

6. Mr. Hill has 50,000 laying hens in his egg production facility. If 1,000,000 dozen eggs are produced each year in this facility how many eggs are produced by each chicken? Remember that there are 12 eggs in a dozen.

7. The local fertilizer plant purchased 1,500 tons of fertilizer at a total cost of $393,600. What is the price per ton of fertilizer?

BONUS QUESTION

Ms. Valley purchased 30 tons (one ton equals 2,000 pounds) of fertilizer to place on her corn crop. If she has 300 acres and the fertilizer cost a total of $7,872, how much did the fertilizer cost per pound and how much did she place on each acre?

MEASUREMENT

Most measurements in agriculture have not yet converted to the metric system. In this exercise students should work the first half of each problem with the traditional system and the second half with the metric system. If students use a calculator on this section carry out all decimal places.

1. The area of Mr. Coolidge's rectangular milo field can be calculated by multiplying the length times the width. He needs to know the area so that he can purchase seed to plant this coming spring. The field is 2,000 feet long by 450 wide. He wants to plant 6 lbs. of seed per acre. (Hint - an acre is equal to 43,560 square feet.) How much seed should Mr. Coolidge purchase?

Now do the same problem with a field size of 610 meters long and 140 meters wide. The amount of seed needed is 6 kg per hectare (a hectare is equal to 10,000 square meters).

2. A unit train of wheat is loaded in McCook. Each one of the 72 cars on the train holds 100 tons (one ton equals 2,000 lbs.). If the price loaded on the train is worth $116.67 per ton, what is the value of the unit train of wheat?

Now do the same problem with a unit train of 72 cars where each car holds 91 metric tons of wheat. If a ton is worth $128.34, what is the value of the train load of wheat?

3. If a square mile contains 640 acres (One mile equal 5,280 feet), how many acres are in a rectangular field measuring one-half mile by one-half mile? (Remember that, if you need it, one acre equals 43,560 square feet.)

Now calculate the number of hectares in an area of .50 kilometers by .50 kilometers. (Remember that there are 1,000 meters in a kilometer and that there are 10,000 square meters in a hectare.)

4. The fuel tank on a large tractor holds 80 gallons of fuel. If the fuel weighs 2 lbs. per quart and there are 4 quarts per gallon, how many pounds of fuel does the fuel tank hold?

The fuel tank of the metric tractor holds 300 kilograms of fuel. If the fuel weighs .95 kilograms per liter, how many liters does the tank hold?

5. There are 38 steers that were sold at the stockyards. Their total weight was 45,600 lbs. If the steers are worth $60.00 per hundredweight, (A hundredweight equals 100 lbs.), what is each steer worth? What is the total value of the 38 steers?

If the same 38 steers are weighed on a metric scale, what is their weight in kilograms if 2.2 pounds equal 1 kilograms? If the price is now changed to $1.32 kilogram, what is the new value of the 38 steers?

EASY WHEAT BREAD

Mix in a heavy plastic bag or bowl:
1/2 cup all-purpose flour
1 pkg. yeast
1/2 cup warm water
2 tablespoons sugar

Work bag with fingers until completely blended. Close top of bag and rest 15 minutes. (Mix with spoon and cover with cloth.)

Add:
2 cups whole wheat flour
3/4 cup warm water
1 tablespoon vegetable oil
2 teaspoons salt

Mix well, slowly add enough flour to make a stiff dough, 1 - 1 1/2 cups. Turn dough out onto floured surface. Knead 5-6 minutes. Add more flour if too sticky. Cover with plastic bag. Let rise 10 minutes.

Shape and put in greased pan, cover again with bag and or cloth and let rise 45 - 60 minutes. Bake 30 -35 minutes in 400 degree oven.

Remove from pans, cool on wire rack.

Wheat Nutrition: High in B vitamins
High in carbohydrates (energy)
Source of incomplete protein

IF THE BREAD MADE IN THE CLASSROOM WILL BE BAKED AT HOME AND HAS DOUBLED IN SIZE:

1. Take the dough from the pan, punch down, reshape into loaf, place back in pan and let rise 45 - 60 minutes.
2. Bake 30 - 35 minutes in 400 degree oven.

If making full recipe at home (will make 1 loaf of bread) follow directions on previous page and then bake in 400 degree oven.

Supplemental resource materials are provided by the Nebraska Wheat Board.

The 4-H Wheat Science project is coordinated by the Nebraska Cooperative Extension Service and your local Extension office.

STUDENT ACTIVITY SHEET — BREAD THE WORLD OVER

THE HISTORY OF BREAD

Fill in the blanks with the correct word(s) to complete the sentence.

Sourdough	Journey Cake
Greece	Egypt
China	Corn Pone

1. The first bread was made in _____ or _____.
2. The Egyptians were the first to discover that the dough would raise if they let it sour or ferment before baking. This was the first _____.
3. The first public bakers were in _____.
4. In frontier America, bread made from meal and water and baked in a pan was called _____.
5. Johnny Cake was an American Indian bread, sometimes called _____ because it was often carried by travelers.

STUDENT ACTIVITY SHEET — BREAD THE WORLD OVER

INTERNATIONAL BREADS

STUDENT ACTIVITY SHEET — BREAD THE WORLD OVER
INTERNATIONAL BREADS

How many breads from other countries do you know? Write the country next to the correct bread.

China	Czechoslovakia	England	France
Germany	India	Ireland	Israel
Italy	Japan	Mexico	Middle East
Pakistan	Russia	Scotland	Sweden

BREAD	COUNTRY
Kolaches	_____
Biscuits	_____
Stollen	_____
Irish Soda Bread	_____
Grissini	_____
Naan	_____
Tortillias	_____
Pan	_____
Koulitchey	_____
Hua-chuan	_____
Baguette	_____
Scone	_____
Pita	_____
Chapatti	_____
Limpa	_____
Challah	_____

STUDENT ACTIVITY SHEET — BREAD THE WORLD OVER

BREAD AND CUSTOMS

Bread plays an important part in family, ethnic and cultural customs. Does your family or community have any customs involving bread? Please write those customs in the space below.

FAMILY CUSTOMS: _____

_____

_____

_____

COMMUNITY CUSTOMS: _____

_____

_____

_____

BREAD TEASER

Do you know these customs using bread?

- In ancient times, Egyptian bread was a symbol of truth. Persons took a sacred oath with their right hand touching the top of the loaf.
- Jews use special flat bread called matzos for Passover.
- Orthodox Russians have special bread called Koulitchey for Easter.
- In Latin America on All Soul's Day, the dead are remembered by bread offerings which are taken to the cemeteries. Gifts of bread are also made by the living and given to each other.
- In Germany, St. Nicholas Day is celebrated with a sweet dough made into the shape of his helper, Peter, carrying a bundle of twigs.
- In Sweden, the bride and groom eat a whole wedding bread to symbolize a faithful and happy marriage.

SPROUTED WHEAT... An Unusual Sensation

By Jan A. Peterson
Oregon Wheat Growers Association

The sprouting sensation not only includes alfalfa, but native wheat kernels. Wheat sprouts offer a nutty flavor that many people enjoy.

If you have never "sprouted" before, be prepared for a new sparkle in your salads, new freshness in stews and casseroles, and a new taste experience in omelets, tacos and sandwiches.

Summer salad crispness can be available year round, for sprouting can be done any season of the year. The bonus beyond the crispness is the sprouted kernels; protein, minerals, and Vitamins B and C. Vitamin C increases during the early sprouting stage, but starts to decline after about 50 hours.

Use a glass jar, **please remember "NEVER SPROUT SEEDS THAT HAVE BEEN TREATED FOR PLANTING."**

Sprouting the Bottle Method:

1. Soak wheat kernels overnight by putting 1/2 cup into a jar with two or three cups of room temperature water, about 70°. If water is much warmer; molds are more likely to grow. Be sure that wheat is moist to create a complete soak.
2. In the morning, fasten a piece of nylon or cheesecloth over the mouth of the bottle. Pour off the water and rinse sprouts at least twice with lukewarm water and drain.
3. Repeat the rinse step 3 to 4 times a day. Drain well, the seeds should be moist, not wet.
4. After two or three days the wheat sprouts should be about **1/4 to 1 inch long** and **ready** for one of your favorite recipes.
5. If it's necessary to store sprouts, refrigerate them in a firm, air-tight container. Wheat sprouts will keep a few days to over a week depending on how dry they are when stored and how cold your refrigerator is.
6. One cup of wheat yields about 3 cups of sprouts.

Recipes Using Sprouted Wheat

Sprouts with Hot Cakes

Make your own favorite hot cake batter. Pour hot cakes out onto the griddle. Sprinkle with a few wheat sprouts before turning.

Drying Wheat Sprouts

Did you grow too many sprouts? Do not throw them away. Spread them thin on a cookie sheet and keep in a warm room; away from insects. They will dry quickly and can be sprinkled on top of casseroles or powdered into flour.

Sprouted wheat, after drying will retain its increased nutritional value. These sprouts also freeze well.

Wheat sprouts uses are endless and unlimited and can be used as far as your imagination reaches.